H35ITC---8910109997

In house copy 15 of 20

INTERNATIONAL TECHNOLOGY CORPORATION

91873

Project No. 303486
October 1989

Addendum Report

Soil-Gas Survey
Phase I - Preliminary Investigations
Remedial Investigation/Feasibility Study
Woodlawn Landfill
Cecil County, Maryland

Prepared By:

IT Corporation
Monroeville, Pennsylvania

AR300935

A23GBMMRN8911300379

Firestone

TELEX NO.: 666114 or 98-64-31
CABLE ADDRESS: FIRESTONE, AKRON, (OHIO)
TELECOPY: 216-379-6386

November 30, 1989

Dr. Mark R. Noll
Enforcement Project Manager
U.S. Environmental Protection Agency
Region III
841 Chestnut Building
Philadelphia, PA 19107

Re: Submittal: Updated pages for Phase I Reports, Phase II and IV Work Plans, RI/FS Reports Plan, QAPP and Health and Safety Plan; Woodlawn Landfill RI/FS, Cecil County, Maryland.

Dear Dr. Noll:

Enclosed are three (3) copies of each of the updated pages for the subject documents which are being submitted in accordance with the project Consent Order (U.S. EPA Docket No. III-89-05-DC, December 28, 1988). These documents are referenced as follows:

(1) Report (Revision 01)
Phase I - Preliminary Investigations
Exclusive of Soil-Gas Survey Report and Resulting Recommendations
Dated September 5, 1989; Revised November 30, 1989 (Revision 01)

(2) Addendum Report (Revision 01)
Soil-Gas Survey
Phase I - Preliminary Investigations
Dated October 10, 1989; Revised November 30, 1989 (Revision 01)

(3) Detailed Work Plan (Revision 02)
Phase II - Site Characterization
Dated September 5, 1989; Revised October 10, 1989 (Revision 01), November 30, 1989 (Revision 02)

(4) Detailed Work Plan (Revision 02)
Phase IV - Additional Field Work
Dated September 5, 1989; Revised October 10, 1989 (Revision 01), November 30, 1989 (Revision 02)

(5) Plan (Revision 01)
RI/FS Reports
Dated September 5, 1989; Revised November 30, 1989 (Revision 01)

AR300936

(6) Quality Assurance Project Plan (Revision 05)
Including Phases I, II, and IV
Submitted December 5, 1988; Revised: February 6, 1989 (Revision 01), April 20, 1989 (Revision 02), June 13, 1989 (Revision 03), September 5, 1989 (Revision 04), and November 30, 1989 (Revision 05);

(7) Health and Safety Plan (Revision 05)
Including Phases I, II, and IV
Submitted December 5, 1988; Revised: January 30, 1989 (Revision 01), April 20, 1989 (Revision 02), June 13, 1989 (Revision 03), September 5, 1989 (Revision 04), and November 30, 1989 (Revision 05).

Please advise us if you have any questions or comments.

Sincerely yours,

George B. Markert

George B. Markert
Senior Environmental Consultant
Corporate Environmental Affairs

GBM:AMJ:jit
Enclosures

cc: Ms. Laura Boornazian, U.S. EPA - III (no enclosures)
Mr. David Healy, MDE (one copy of each enclosure)
Mr. Barry Belford, Cecil County (one copy of each enclosure)
Mr. Mark Grummer, Kirkland & Ellis (one copy of each enclosure)
Dr. Alan M. Jacobs, IT Corporation (no enclosures)

ADDENDUM REPORT
SOIL-GAS SURVEY
PHASE I - PRELIMINARY INVESTIGATIONS
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
WOODLAWN LANDFILL
CECIL COUNTY, MARYLAND

PREPARED BY:

IT CORPORATION
MONROEVILLE, PENNSYLVANIA

OCTOBER 10, 1989
REVISED NOVEMBER 30, 1989 (REVISION 01)
PROJECT NO. 303486

Prepared by:

amg Date 11/28

Alan M Jacobs Date 11/28/89
IT Project Manager

Lawrence J Hase Date 11/28/89
IT Project Director

Date 11/30/89
IT Quality Assurance Officer

George B. Mallet Date 11/29/89
Client Representative

TABLE OF CONTENTS

TABLE OF CONTENTS
(Continued)

AR300940

LIST OF TABLES

LIST OF FIGURES

ADDENDUM REPORT
SOIL-GAS SURVEY
PHASE I - PRELIMINARY INVESTIGATIONS
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
WOODLAWN LANDFILL
CECIL COUNTY, MARYLAND

1A.0 INTRODUCTION

This report is called the Addendum to the Phase I Report (Phase I - Preliminary investigations, Remedial Investigation/ Feasibility Study, Woodlawn Landfill, Cecil County, Maryland, September 1989).

The reader is referred to Chapter 1.0 (INTRODUCTION) of the Phase I Report for introductory material including the:

- Objectives of Phase I Work
- Site Background

Section 2A.2 (Soil-Gas Survey) of the Addendum replaces Section 2.2 of the Phase I Report.

Chapter 3A.0 (Conclusions and Recommendations) of the Addendum supplements and/or replaces Chapter 3.0 of the Phase I Report.

2A.0 PHASE I INVESTIGATIONS (ADDENDUM)

The report on the soil-gas survey is presented in this Addendum to the Phase I (Preliminary Investigations) Report, as agreed to by the United States Environmental Protection Agency (U.S. EPA) on August 11, 1989 (Appendix A). The Phase I Report that was submitted on September 5, 1989 included the tasks from Phase I except for the soil-gas survey. The soil-gas survey was not included because the field work was delayed because of heavy and frequent precipitation that would have adversely affected the results. The reasons to delay and the decision rationale for postponement of the soil-gas field work until suitable conditions were present is prescribed in the Detailed Work Plan for Phase I (Revision 02), dated June 13, 1989 (DWP-I) and is discussed further in U.S. EPA-approved (Appendix A) plan modifications (correspondence dated August 24, 1989).

Section 2.1 (Data Management), Section 2.3 (Surface Geophysical Surveys), Section 2.4 (Existing Well Evaluation), Section 2.5 (Topographic Survey), and Section 2.6 (Aerial Photographic Interpretation) of Chapter 2.0 (Phase I Investigations) have been presented in the original Phase I Report. Section 2.2 (Soil Gas Survey) of the original Phase I Report is being replaced by the following Section 2A.2.

2A.2 SOIL-GAS SURVEY

2A.2.1 Basis for Soil-Gas Survey

Soil-gas surveys are based on the premise that the partitioning (separation) of the volatile fraction of a subsurface compound from the aqueous or soil phase into the vapor phase may yield detectable concentrations of these volatile organic compounds (VOCs) in the soil gas. The partitioning of compounds between phases is thermodynamically driven and results in a low energy state which (in idealized systems) can be expressed as a relatively constant ratio between the concentrations present in each phase (soil-gas or liquid/gas). Therefore, the vapor phase concentration of a compound generally increases with increasing concentration of contaminated soil and ground water.

Soil-gas surveys can produce information so that isopleth maps (showing lines of equal concentrations) that depict trends in VOC vapor concentrations in the soil can be constructed. In some cases, it is possible to distinguish between multiple sources of VOC compounds based upon the concentration and distribution of chemical constituents found in the soil gas throughout the site. Additionally, it is often possible to identify and approximate the boundaries of potential migration routes of

AR300944

a compound within an aquifer based upon the distribution patterns evident from these maps.

The maps show relative concentrations. The concentrations of VOCs in the soil gas can be correlated with concentrations of VOCs in the soil and soil moisture to a limited degree depending on the volatility of the compounds and the physical properties of the soil as affected by weather.

Soil-gas data are best used to identify and prioritize areas of concern and to add to the geochemical data base. The data are used to make decisions regarding more explicit investigations and/or remedial strategies.

2A.2.2 Target Compounds

Based on a review of existing ground water analytical data and known site history, specified individual "target" compounds have been used for specific quantification, including:

Methyl Ethyl Ketone (2-Butanone, MEK)

Dichloromethane (Methylene Chloride, DCM)

Chlorobenzene (Phenyl Chloride)

1,1-Dichloroethane (Ethylidene Chloride, 1,1-DCA)

1,2-Dichloroethylene [Two Isomers: trans and cis]

Trans 1,2-Dichloroethylene (trans 1,2-DCE)
Cis 1,2-Dichloroethylene (cis 1,2-DCE)

Tetrachloroethylene (PERC)

Tetrahydrofuran (THF)

Toluene

Trichloroethylene (TCE)

Vinyl Chloride (Chloro Ethylene, VCM)

Total Volatile Organic Compounds (toluene
equivalence) (Total VOCs)

Although the DWP-I specified only 10 target compounds, the above list includes 11 individual compounds including two isomers of one of the target compounds--1,2-DCE. In addition to these 11 compounds, this list includes Total VOCs. The Total VOCs include as many as 200 compounds (target compounds and others).

These compounds have been previously detected in the ground water from the site. Additionally, the compounds are representative of a variety of classes of VOCs and exhibit a range of physical/chemical properties (density, solubility, octanol/water partition coefficient, Henry's law constant and vapor pressure). Because the partitioning and migration of individual compounds in the ground water are dependent upon many of these properties, analyzing compounds which exhibit a range of properties could provide a complete picture of solute migration at the site.

The concentrations of the compounds from preliminary testing (Section 2A.3) are presented in Table 1. The concentrations from the main grid sampling and laboratory analysis (Task A) (Section 2A.4) are presented in Table 2. The concentrations from soil-gas screening (Task B) (Section 2A.5) are in Table 3. The concentrations are presented in micrograms per liter (ug/l) of soil gas. As discussed in the DWP-I, one ug/l equals 775 ppb.

Areas of relatively high concentrations of compounds in the soil gas will be referred to as "soil-gas anomalies," similar to that designation used in the geophysical survey results. The misused term "hot spots" will not be used for three reasons:

- "Hot spots" usually refer to areas of soil contamination or areas of known waste products. The locations of soil-gas anomalies may be different from actual "hot spots."

- The grid points of relatively high concentrations (as compared with adjacent grid points) of compounds in the soil gas, using a method having low-detection limits, may not be necessarily "hot" (actual high concentration levels).

- Grid points of relatively low concentrations (as compared with adjacent grid points) of compounds in the soil gas, may not be "clean areas," but rather do not contain relatively high concentrations of compounds in the soil gas.

2A.2.3 Objectives of the Soil-Gas Survey

The objectives of the soil-gas survey are to help identify and approximate the following:

- Areas exhibiting known and/or potential soil contamination (VOCs)

- Potential migration routes (solute plumes) of the VOCs in the ground water

- Possible locations, numbers, and intervals for the placement of well screens in additional monitoring wells to be installed in Phase II

To achieve these objectives, methodologies were used in the following tasks as discussed below (Sections of this text):

- Preliminary Testing (2A.3)

- Grid Sampling and Laboratory Analysis (Task A) (2A.4)

- Soil-Gas Screening (Task B) (2A.5)

2A.2.4 Quality Assurance/Quality Control

As specified in the DWP-I, Quality Assurance/Quality Control (QA/QC) for the soil-gas survey was maintained by:

- Collection of samples from an additional 10 percent of grid locations in duplicate that produced A and B adsorbent-tube pairs. The A tubes were analyzed by a gas chromatograph using

AR300947

a flame ionization and an electron capture detector (GC/FID-ECD), and the B tubes were analyzed by a gas chromatograph using a mass spectrometer (GC/MS). Table 4 lists the concentrations of compounds from the duplicate samples analyzed by GC/MS.

- Generation and analysis of spiked field and laboratory samples in duplicate of 10 percent of total samples collected to verify the compound recovery and the precision of field and laboratory procedures (Tables 5 and 6).
- Generation and analysis of rinsate blanks of 10 percent of total samples collected to verify the effectiveness of the decontamination of field equipment (Tables 7 and 8).

2A.2.5 Organization of the Following Sections

The following sections in the 2A series describe the tasks of the soil-gas survey. They include the Preliminary Testing (Section 2A.3), the Grid Sampling and Laboratory Analysis (2A.4), and the Soil-Gas Screening (2A.5). Each of these sections describes the objectives, methodology and procedures, data results, interpretation, and QA/QC results.

These sections (2A) are followed by sections in the 3A series, which present the conclusions and recommendations for work in subsequent phases of the RI/FS.

2A.3 PRELIMINARY TESTING

Prior to Tasks A and B, a program of preliminary testing was performed to refine the field/laboratory procedures.

2A.3.1 Objectives

The objectives of the preliminary testing were to:

- Identify the optimum depth of sampling for Task A

AR300948

- Help laboratory/field personnel to prepare the laboratory equipment and become familiar with procedures

2A.3.2 Methodology and Procedures

To achieve the above objectives, the following methodology was used in the preliminary testing.

- Sample and analyze a total of 20 samples at 10 grid sampling locations along a line of transect prescribed in Figure 5 of the DWP-I. This line starts north of the landfill property boundary, goes through or nearby the approximate locations and terminates in the vicinity of Well F-3. The spacing between samples was approximately 100 feet.

- At each sampling location, two samples were taken: one from a depth of approximately 30 to 36 inches and another at a depth of approximately 60 to 66 inches below land surface.

- Sample and analyze these samples as per the methodologies of the Grid Sampling and Laboratory Analysis task (Task A)

2A.3.3 Data Results

The concentrations of the target compounds and the total VOCs for the preliminary testing are listed in Table 1. The data results can be summarized as follows:

- Eleven grid locations were sampled. One additional grid sample was added to the 10 originally planned. Therefore, twenty-two samples were anticipated (one at the shallow and one at the deep penetration).

- Eight grid locations yielded analytical data from at least one sampling depth. Three grid locations yielded no data because of laboratory difficulties, as discussed below.

- Nine grid locations were sampled at the 30- to 36-inch and the 60- to 66-inch depths. Two grid locations could not be sampled at the lower depth because of perched water, as discussed below. Four of these nine locations yielded analytical data from both depths. Five of the locations included samples that had tube breakage and laboratory difficulties as discussed below.

Difficulties in achieving analytical results from both depths at all locations included:

- Broken sampling tube during sample collection (one sample; one location).

- FID detector experienced extinguishing of the flame during auto-injection (seven samples; four locations). One of the 200 VOCs may have extinguished the flame. Manual injection was performed thereafter.

- Perched water prevented deeper gas sample to be taken (two samples; two locations).

2A.3.4 <u>Interpretations</u>

From these data, the following interpretations were made:

- Future sampling will be at the shallower depth only because:

  - Where specific target compounds were found, they were found at both depths.

  - There was no systematic increase or decrease in concentrations at the two depths.

  - Ground water may be encountered at the greater depth (precluding gas sampling)

  - The basic sampling and analytical method in the DWP-I will be followed with the exception of auto-injection of the desorbed sample into the gas chromatograph (GC) or adjustments in procedures to prevent extinguishing the flame on the FID

- Data from the GC with the electron-capture detector (ECD) will be used only on a qualitative basis because:
  - ECD is extremely sensitive to multihalogenated compounds and to electron capturing interferences in many of the samples; therefore,
  - The magnitude of the ECD response in many samples was so great, that individual target compounds were totally obscured or not clearly resolved.

2A.3.5 QA/QC Results

Field matrix spikes (Table 5) showed erratic recoveries among the various compounds. Precision between the duplicates was good.

Rinsate blanks (Table 7) showed that decontamination procedures were effective. Extraneous contamination was not introduced from the sampling equipment.

2A.4 GRID SAMPLING AND LABORATORY ANALYSIS

Samples of the soil gas were obtained at grid locations according to Figure 1. These samples were analyzed in the laboratory using GC and GC/MS methods to determine the concentrations of the target compounds and the total VOCs. Isopleth maps of these concentrations were constructed and evaluated. As described in the DWP-I, this work is called Task A.

2A.4.1 Objective

The objective of Task A was to identify areas at the site that contain anomalous concentrations of compounds in the soil gas.

2A.4.2 Methodology and Procedures

To achieve this objective, soil-gas samples were collected at points designated from a grid (Figure 1). These procedures were approved as

AR300951

per the DWP-I. This grid was designed such that a total of approximately 125 sampling points are distributed across the site and onto the surrounding properties. The grid spacing is tighter in areas of known or suspected waste and in areas where it is suspected from chemical data of well samples that solutes may be migrating off site. This grid was modified in the field to a minor extent to avoid obstructions and areas of standing water on the surface.

The grid was laid out using land-surveyed control points. Each grid point was marked with a pin flag. The grid points were identified according to their coordinates. The origin (0,0) of the coordinate system was placed at the northwest corner of the landfill. From the origin, the positive x- direction was to the east; the negative x-direction was to the west. Also from the origin, the positive y-direction was to the south; the negative y-direction was to the north. In using computer plotting techniques, as discussed in Section 2A.4.4, the y-coordinates had to be transposed in such a way that the positive y-direction was to the north. This required shifting the origin 1500 feet to the south of the northwest corner of the boundary and changing the y-coordinate to a value equal to the difference between the field coordinate and 1500. Table 2 shows the original, field y-coordinates and the transposed y-coordinates.

The samples were numbered separately and keyed to the grid location coordinates. At some grid points, several individually numbered samples were taken in duplicate for QA/QC purposes.

Soil-gas samples were collected through special 1/4-inch outside-diameter (O.D.) probes that were made of stainless steel. The length of the probe was 36 inches. They contained multiple holes machined into a six-inch segment of the probe, immediately above an end which has been sharpened for soil penetration. These probes were inserted into 1/2-inch O.D. holes created by driving a 1/2-inch bar into the ground with the use of slide hammer. Each sampling probe was then driven approximately six inches farther into the soil and the hole was carefully sealed around the probe by the packing of laboratory-tested-clean clay.

Vapor samples were collected by passing approximately 1.0 liter of soil gas (from the probes) through a tenax/carbon sorbent tube (VOST tube) attached via a stainless steel/teflon fitting to the end of the probe. The opposite end of this VOST tube was attached to a calibrated syringe. The descriptions of the VOST tube and the syringe are detailed in the DWP-I.

Following sample collection, the female compression fittings of the VOST tubes were capped by brass male plugs and then placed in labeled, laboratory-tested-clean test tubes. The VOST tubes were then placed inside the test tubes and sealed with a hydrocarbon free, nitrogen atmosphere.

The samples were placed in insulated lockers with "blue" ice and transported to the laboratory for analysis.

2A.4.3 Data Results

The concentrations of the target compounds and the total VOCs for Task A (Grid Sampling and Laboratory Analysis) are listed in Table 1.

Of the 127 sampling locations attempted, there are analytical data from 108 locations. The problem causing this difference (19 tubes) was VOST tube breakage during shipping and analysis, water intake during sampling, and analytical difficulties. This loss of samples was not significant to the achievement of the objectives of Task A, because lost data were not concentrated in any one part of the site (see Figure 1). Therefore, the 108 locations were considered ample to achieve reliable results.

2A.4.4 Interpretation

To evaluate the data, the concentrations of target compounds and total VOCs (toluene equiv.) were calculated from gas chromatograms. These concentrations were recorded and stored on a Lotus 1,2,3 work sheet. From this data file, isopleth maps were generated using Surfer (Grid and Topo) software. Parameters chosen on Surfer were:

GRID:

Method: Inverse Distance; Weighting Power: 2
Search Method: Normal

TOPO:

Input grid size: 25 x 25
Number of x-data units per inch: 200
Y-unit = 1 x-unit
Contour: Minimum, Maximum, Interval, Labeling:
Varies with Plot
Smoothing: Tension factor 2
Plot size: 11.000 x 13.600
Output to AutoCAD on DXF file.

The isopleth maps of the various target compounds and the total VOCs (toluene equiv.) are presented on Figures 2 through 13.

The most interesting findings of these data are the absence of soil-gas anomalies in Cells B/C, the weak anomaly of Cell A, and the strong anomalies away from the cells in the west-central part of the landfill and in the area to the southwest of Cells B/C. These findings result from the fact that the cell contents are not significantly contributing VOCs (including vinyl chloride monomer (VCM)) to the soil gas, as compared with other areas of the site. Some possible reasons for this are:

- The cell contents did not yield soil gas within 3 feet of the surface in spite of the fact that samples were taken into the cell contents (as indicated by the observation of white powder beneath the clay cap material in several slam-bar holes).

AR300954

- The cell contents of VOCs have migrated out of the cells.
- Conditions in the cells are different from conditions outside the cells causing different production rates of VOCs in the gaseous phase.

Some of the soil-gas anomalies correlate with the geophysical data, specifically with the EM31 and EM34 data.

The distribution of individual target compounds follows the distribution of total VOCs (toluene equiv.) except for trans 1,2-DCE. Vinyl chloride, tetrachloroethylene and chlorobenzene, for example, show anomalies that are present on the total VOCs (toluene equiv.) map. There are insufficient data at present to determine the reason for the trans 1,2-DCE disparity.

To the north of the site boundary and well B-1, there are no indications of soil-gas anomalies. This may indicate that solute plumes are not migrating north of the site boundary. The absence of soil-gas concentrations, however, does not provide definitive proof for the absence of contamination in the ground water or in the soil. Layers of soil may retard the migration of soil gases. The thickness of soil above ground water in this area is approximately 40 feet.

More attention must be paid to the soil-gas anomalies at the western edge of the site. Preliminary indications of the direction of ground water flow in the soil and, correspondingly, the potential direction of solute plumes in the soil indicate that solutes present at the western edge of the site may be migrating off site.

Monitoring wells will add more definitive data to the potential presence and movement of solute plumes. The soil-gas survey results will be beneficial in efficiently placing these wells.

2A.4.5 Possible Sources, Transformations and Fate of the Target Compounds

The possible sources of vinyl chloride monomer, one of the 11 target compounds at the Woodlawn Landfill site, include:

- Polyvinyl chloride (PVC) sludge that was placed on site in Cells A, B, and C and in other sections of the landfill. The sludge is known to have contained residual vinyl chloride, which is presently bound to some degree in the PVC polymer.

- Breakdown products of chlorinated hydrocarbons (e.g., tetrachloroethylene [PERC], trichloroethylene [TCE], trichloroethane [TCA], and dichloroethylene [DCE]). These transformations take place in an acidic environment (common to landfills) by biotic activity. Chemically, this results in cleaving of chlorogroups (chlorine is removed and hydrogen is added, leaving the double-bonded ethylene intact).

Possible sources of the other ten target compounds are municipal trash and other industrial wastes. Although some of the target compounds can transform into vinyl chloride, vinyl chloride cannot be the source of the other ten compounds. The transformations into vinyl chloride are irreversible in nature.

These conclusions are based on the soil-gas survey and published literature as follows.

Conclusions from soil-gas survey:

- The "fingerprint" of soil-gas concentrations from the area of the cells showed no anomalies of halogenated hydrocarbons including vinyl chloride or compounds that could have degraded into vinyl chloride. This discrepancy occurred even though it is known that PVC sludge was placed in the cells and that it contained vinyl chloride monomer.

AR300956

- The areas having soil-gas anomalies outside the cells show a very different "fingerprint" than the cell areas. The anomalies have higher concentrations of vinyl chloride and compounds that could have degraded into vinyl chloride. The soil-gas concentrations of vinyl chloride in Cells B/C and areas near Cell A were 0.00 to 0.36 μg/ℓ, whereas the maximum concentrations in the three largest soil-gas anomalies were 1.87, 1.31, and 1.52 μg/ℓ (Figure 3).

Conclusions from published literature:

- The degradation of halogenated hydrocarbons, including those compounds that are present in the soil-gas anomalies at Woodlawn, are common to nonhazardous waste landfills (receiving only municipal trash) (California Air Resources Board, June 1989, "The Landfill Gas Testing Program: A Second Report to the California Legislature"). Vinyl chloride is one of the compounds that was present in concentrations greater than that measured at Woodlawn. Its presence, as stated in the literature, can be attributed to the "in situ action of bacteria on chlorinated solvents, and can be found in [municipal] landfills that have been closed for over 30 years" (Wood, J. A. and M. L. Porter, May 1987, "Hazardous Pollutants in Class II Landfills," Journal Air Pollution Control Association, Vol. 37, No. 5).

- "The rate of biodehalogenation of vinyl chloride may proceed at a rate significantly slower than the rates of the reactions that produce it" (Wood and Porter). This was further demonstrated in the literature (Parsons, E., P. R. Wood, and J. DeMarco, February 1984, "Transformation of Tetrachloroethene and Trichloroethene in Microcosms and Ground Water," Jour. AWWA, pp. 56-59).

- "Perchloroethylene [PERC] and trichloroethane [TCA] are readily converted into vinyl chloride . . . by microorganisms" (Wood and Porter). PERC has been found in the soil gas at the western part of the Woodlawn site in a soil-gas anomaly that also contains vinyl chloride and other halogenated hydrocarbons.

AR300957

- "Laboratory studies indicated that vinyl chloride is the final chlorinated product of the sequential reductive dechlorination of chlorinated ethenes" (Barrio-Lage, G. A., H. E. Archer, and R. M. Narbaitz, 1989, "Enhanced Aerobic and Anaerobic Biotransformation of Vinyl Chloride in Ground Water Environments," pp. 848-864, Physiochemical and Biological Detoxification of Hazardous Wastes, Technomic, Lancaster, Pennsylvania).

In summary, the soil-gas survey and published literature indicate that:

- Vinyl chloride is not being released from the PVC sludge residues in the cell areas and probably not from other PVC sludge residues in noncell areas.
- Other chlorinated hydrocarbons that degrade into vinyl chloride have been found on the site.

2A.4.6 QA/QC Results

Duplicate samples from 13 grid locations and three field blanks were sent to IT's laboratory (IT Analytical Services- ITAS) in Cincinnati, Ohio, for GC/MS analysis. One of the three field blanks was run.

The analytical results of these samples were then compared with their duplicates that had already been run using GC/FID-ECD.

The duplicate samples were analyzed using ITAS VOST Protocol. Detection limits are based on concentration in the total sample and are expressed in Total Nanograms. GC/FID results are recorded in Micro-Grams per Liter. One micro-gram equals 1000 nanograms.

Table 4 compares the GC/MS data with the GC/FID data. The correlation is good:

- GC/MS highs are GC/FID highs
- GC/MS lows are GC/FID lows

- Sample Nos. 4280 (GC/MS) and 4113 (GC/FID) have excellent VCM, toluene, and chlorobenzene correlation. The others were good.

The rinsate blank results (Table 8) indicate the decontamination procedures were adequate.

The field matrix spikes had poor results (Table 6) because:

- Recoveries were generally low (VCM was not recovered at 10 times the detection limit)
- Precision between duplicate samples was poor

The observed precision may have resulted from leakage in the dual syringe sampler that was dedicated for the matrix spike field sampling. Because excellent recoveries and high precision are routinely documented in the laboratory-prepared-spikes (over holding times of three weeks), field data also may be the result of adverse field conditions such as lack of temperature control and ultra-violet (UV) radiation (double-bonded compounds are UV-sensitive). An identical but separate dual syringe sampler was used for duplicate sampling for GC/MS analyses. These data had good precision.

2A.5 SOIL-GAS SCREENING

A field photoionization detector was used to perform soil-gas screening of additional sampling points. As described in the DWP-I, this work is called Task B.

2A.5.1 Objectives

The objectives of Task B were to:

- Increase the resolution of the survey
- Identify additional areas that showed relatively high levels of VOC concentrations for additional VOST tube collection

- Approximate the boundaries of areas of known waste placement

2A.5.2 Methodology and Procedures

To achieve these objectives, photoionization detector (PID) probes were used to analyze soil-gas samples in the field (measuring total VOCs). The locations of these samples were chosen on the basis of knowing or suspecting areas where waste was placed. These areas included Cells A, and B/C, and an area in the northwest corner of the site where trenching operations were indicated from visual inspection. Once a relatively high concentration of VOCs were detected by PID screening (Task B), the location was subject to the same rigorous sampling and analysis as per Task A.

PID probes were used to draw soil gas into the apparatus, where a high-energy light source ionized VOCs within the sample gas. The probe then translated the signal produced from the detector into a unitless number, which is a semiquantitative determination of the concentration of ionizable compounds in the sample gas.

The PID probes were used at locations where buried waste was suspected (near buried trenches, Cells A and B/C, near a partly buried drum, in discolored soil) and at random locations.

2A.5.3 Data Results

Seventeen readings were taken in the field. Table 3 presents the PID readings and locations. One reading was high enough to warrant taking an additional VOST tube (Sample No. 1291). The area of Cells A and B/C displayed relatively low readings.

2A.5.4 Interpretations

Soil-gas screening with a field PID (Task B) was not as effective as compared with the Grid Sampling and Laboratory Analysis (Task A). The PID did not increase the resolution of the survey because of the lower detection limits of the PID. Furthermore, two main areas of known waste disposal Cells A and B/C proved to be areas of relatively low VOC soil-gas concentrations. Consequently, the boundaries of these areas could not be mapped. The one additional VOST tube that was collected on the basis of a high PID reading (100 ppm), resulted in detection of no target compounds and only a 1.35 micro-gram per liter concentration of total VOCs (toluene equiv.).

2A.5.5 QA/QC Results

Calibration was performed daily as per the QAPP using IsoC_4H_8.

3A.0 CONCLUSIONS AND RECOMMENDATIONS (ADDENDUM)

The soil-gas survey is complete. The survey results adequately achieved the objectives as presented in the approved DWP-I. Although soil-gas anomalies have been found in places on site, the presence of soil or water contamination is inconclusive at this phase of the investigations. Further investigations (in subsequent phases) will add additional information.

The following conclusions and recommendations document the objectives of the soil-gas survey.

3A.1 CONCLUSIONS CONCERNING GROUND WATER FLOW INTERPRETED FROM THE SOIL GAS SURVEY

3A.1.1 Basis

On the basis of the soil-gas survey, some ground water flow directions in the saturated soils above bedrock can be inferred at some locations. In general, solute plumes move in the direction of ground water flow. If these plumes contain dissolved volatile organic compounds (VOCs) and these compounds are detected in the soil gas, then the direction of flow of the solute plumes and the direction of ground water flow can be inferred by mapping the concentrations of VOCs in the soil gas.

The sampling of soil-gas concentrations and preparation of isopleth maps are discussed in Chapter 2A.0 of this report. Isopleths (lines of equal concentration) are elongated in the direction of flow, sometimes made more evident by removing the influence of relatively very high soil-gas anomalies. The down-gradient direction is also inferred from the wider spacing of contours along these elliptical axes. The spacing is wider because the solutes are transported away from the source where they are diluted by the ground water.

Therefore, the directions of ground water flow in the soil above bedrock can be inferred from orientations and centers of concentrations of the soil-gas isopleths. This procedure was followed in the evaluation of the soil-gas data.

3A.1.2 Conclusions

Conclusions concerning ground water flow directions in the saturated soils above bedrock from Phase I Investigations including soil-gas results are as follows:

- In the central part of the site, ground water flow direction is towards the south-southwest. This correlates with:

  - The slope of the bedrock surface from geophysical (seismic refraction) and drilling data

  - Ground water contours drawn from pre-Phase I water-level data

  - Elongation of isoconductivity contours from the geophysical (EM31 and EM34) data

  - The topographic slope, which usually is an indicator of subsurface flow of ground water.

- In the northern part of the site, a solute plume was not detected and, hence, ground water flow direction cannot be inferred from the soil-gas data. Other data indicate that the ground water table in the saturated soils in this area is level to gently sloping, resulting from a topographic high in the land surface and in the bedrock surface. Because of the very low concentrations of VOCs in the soil gas, the soil-gas data cannot prove or disprove the actual direction(s) of ground water flow in the northern part of the site.

- In the western portion of the site, the ground water flow direction cannot be inferred from the soil-gas data. Geophysical and existing well data indicate that the ground water surface slopes to the west-southwest and southwest in the western portion of the site in the vicinity of Well B-4.

  The ground water flow direction in this portion of the site will be determined based on the installation of wells and piezometers described in Section 3A.3.1 of this report (Addendum Report - Soil-Gas Survey, Phase I - Preliminary Investigations, Remedial Investigation/ Feasibility Study, Woodlawn Landfill, Cecil County, Maryland).

3A.2 CONCLUSIONS CONCERNING SOLUTE MIGRATION EXTENT AND DIRECTION OF MOVEMENT INTERPRETED FROM THE SOIL-GAS SURVEY

3A.2.1 Basis

On the basis of the soil-gas survey, some conclusions regarding the extent and direction of movement of solutes from the ground water in the soil above the bedrock surface can be inferred. As discussed above, the elongations and spacing of isopleths can indicate the direction(s) of solute plumes in the ground water. The concentration values and distribution also can be used to indicate the extent of these plumes.

3A.2.2 Conclusions

Conclusions concerning solute migration extent and direction of movement are as follows:

- In the central part of the site, solute plumes are elongated in the southerly direction where ground water flow is towards the south-southwest. This correlates with:

  - The slope of the bedrock surface from geophysical (seismic refraction) and drilling data
  - Ground water contours drawn from pre-Phase I water-level data
  - Elongation of isoconductivity contours from the geophysical (EM31 and EM34) data
  - The topographic slope, which may be an indicator of the direction of subsurface flow of ground water and hence the direction of solute migration.

- In the northern part of the site, solute migration extent and direction of movement cannot be inferred from the soil-gas data. Because of the very low concentrations of VOCs in the soil gas, the soil-gas data cannot prove or disprove the actual direction(s) or extent of solute migration at the northern end of the site.

- In the western portion of the site, in the vicinity of Well B-4, a soil-gas anomaly exists. However, the presence of a conductive solute plume or its migration extent and direction of movement cannot be inferred from the soil-gas data. Geophysical and existing well data indicate that the ground water surface slopes to the west-southwest and southwest. Solute concentrations and migration extent in this portion of the site will be determined based on the installation of wells and piezometers described in Section 3A.3.1 of this report (Addendum Report - Soil-Gas Survey, Phase I - Preliminary Investigations, Remedial Investigation/Feasibility Study, Woodlawn Landfill, Cecil County, Maryland).

3A.3 RECOMMENDATION OF NUMBER, LOCATION, AND INTERVALS OF WELL SCREENS IN MONITORING WELLS TO BE INSTALLED IN PHASE II INTERPRETED FROM THE SOIL-GAS SURVEY

3A.3.1 Additional Wells

The soil-gas survey has not changed the basic recommendation that additional wells be installed in the bedrock aquifer, in the saturated soil, and in perched water horizons. However, recommendations on the number and location of some of these wells have changed. The following are revisions to the recommendations for monitoring wells based on the results of the soil-gas survey.

As would be expected, recommendations for the greatest changes occur in placement of saturated soil aquifer wells, because the soil-gas results are more likely a result of concentrations of VOCs in the soil or in ground water plumes in the saturated soil horizons. Because the placement of wells tapping ground water in bedrock aquifers is in part affected by the location of companion wells that tap ground water in saturated soil horizons, the locations of some bedrock wells also have changed. In addition, bedrock well locations have changed to better monitor possible bedrock ground water contamination because, as inferred from the soil-gas data, ground water contamination could affect the bedrock aquifer. The locations of two saturated soil monitoring wells, ITS-3 and ITS-1, and their respective companion bedrock wells, ITB-3 and ITB-1, will be determined based on an estimation of the slope of the ground water surface as measured by three (saturated) soil piezometers located in the vicinity of each of these two sets of wells (ITS-3/ITB-3 and ITS-1/ITB-1).

Installation of bedrock piezometers may add uncertainty to the placement of bedrock wells because:

- The potentiometric surface of the bedrock aquifer may vary locally (within the locale of the piezometers) depending on local fracture depths.
- The static water level in the bedrock aquifer may have such a gentle slope that it is not regionally significant.

Installation of clustered wells are used to compare and contrast the water quality in the soil versus the bedrock aquifers. The bedrock wells are, therefore, placed in close proximity to the saturated soil wells. If the bedrock wells are located such that they are not near the soil wells, then the comparisons of water quality cannot be made

The slope of the potentiometric surface for the bedrock aquifer will be measured regionally by comparing readings of bedrock monitoring wells and area domestic wells. Recommendations for perched water zone wells have not changed.

Figure 14 shows revised locations of monitoring wells. The following rationale was used to site each well.

WELL NUMBERS ITB-4 AND ITS-4

One bedrock (Well No. ITB-4) and one saturated soil well (ITS-4) at the southern end of the site will remain in the same locations as that presented in the original Phase I Report and the original Phase II Detailed Work Plan because:

- The soil well is down-gradient from waste areas as indicated by soil-gas, geophysics, boring, water level, and topographic data.
- There are no other monitoring wells in the southern part of the site to check for contamination in the ground water

WELL NUMBERS ITB-3 AND ITS-3.

One bedrock (Well No. ITB-3) and one saturated soil well (ITS-3) near the west-central boundary of the landfill are relocated. Their exact location will be determined on the basis of an estimation of the slope of the ground water table in this vicinity as measured by three piezometers ITZ-4, -5 and -6 which will define the plane. After defining the ground water gradient in this area, the wells will be placed down-gradient from the nearby soil-gas anomaly at the west-central boundary of the landfill (south of well B-4) to:

- Estimate ground water solute concentrations down-gradient from the soil-gas anomaly

- Test for off site bedrock ground water contamination to the west

WELL NUMBERS ITB-2 AND ITS-2.

One bedrock (Well No. ITB-2) and one saturated soil well (ITS-2) at the northwest corner of the landfill property are relocated west-northwest of the soil-gas anomaly to be:

- Down-gradient from the soil-gas anomaly and Cells A and B/C
- Companion wells
- Monitoring possible off site ground water contamination in the soil and bedrock

WELL NUMBER ITB-5

The bedrock well near well F-3 remains the same because it will:

- Test for possible contamination of bedrock on site
- Test for possible contamination down-gradient from the cells and geophysical and soil-gas anomalies
- Serve as a companion well to F-3 and SW-1

The saturated soil well near the eastern perched water zone well is omitted because:

- Its location is not down-gradient from cells or any anomalies (including soil-gas anomalies)
- Existing F-wells are nearby.

The proposed saturated soil well at the northwest edge of Cells B/C (that would have been in the same location as former well F-4) is omitted because:

- F-1, F-8 and F-10 are nearby
- The water table in this location is relatively flat
- The location is not near or down-gradient from geophysical and soil-gas anomalies

WELL NUMBERS ITB-1 AND ITS-1

The bedrock well (Well No. ITB-1) that was to be a companion well to B-1 has been relocated. Its exact location will depend on the location of a new saturated soil well (Well ITS-1) to the north of well B-1. This change is necessary because:

- The soil-gas survey did not indicate movement of VOCs to the north, nor could it prove that such movement does not exist.
- The existence of a bedrock divide north of B-1, as determined from the seismic refraction survey, indicates that ground water movement at B-1 may not be to the north. To determine possible ground water movement to the north, it is necessary to focus on the area to the north of the bedrock divide.

The locations of the bedrock and saturated soil wells are to be determined on the basis of estimation of the slope of the ground water table north of the bedrock divide as measured by three piezometers (ITZ-1, -2 and -3) which will define the plane. After defining the ground water gradient to the north, monitoring wells will be placed down-gradient from Cell A.

The saturated soil well will:

- Provide data on the ground water gradient
- Test for a possible contaminant plume to the north

The bedrock well to the north of divide will:

- Estimate ground water direction in bedrock
- Test for possible off site contamination in the bedrock to the north of the site boundary
- Serve as a companion to the saturated soil well

3A.4 IDENTIFICATION OF DOMESTIC WELLS TO BE SAMPLED AND SURVEYED FOR STATIC WATER LEVEL ELEVATIONS IN PHASE II INTERPRETED FROM THE SOIL-GAS SURVEY

There are no changes to the identification of domestic wells to be sampled and surveyed for static water level elevations on the basis of the soil-gas survey.

TABLES

TABLES

TABLE 1

COMPOUND CONCENTRATIONS FROM SOIL-GAS SURVEY PRELIMINARY TESTING (µg/ℓ)

SAMPLE LOCATION		VCM	TRANS 1,2-DCE	DCM	1,1-DCA	CIS 1,2-DCE	MEK	THF	TCE	TOLUENE	PERC	CHLORO-BENZENE	TOTAL VOLATILES[a]	TOTAL PEAKS RESOLVED
212N-1007E	(36 inch)[b]													
	(66 inch)	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.05	0.24	0.26	8
280N-934E	(36 inch)	0.02	0.01	0.02	0.02	ND[c]	0.03	ND	ND	0.03	0.05	ND	0.44	18
	(66 inch)	ND	0.03	0.02	0.01	0.02	0.10	ND	0.02	-[d]	-	-	2.47	40
300N-1000E	(36 inch)	-	-	-	-	-	-	-	-	-	-	-	-	-
	(66 inch)	-	-	-	-	-	-	-	-	-	-	-	-	-
380N-915E	(36 inch)	-	-	-	-	-	-	-	-	-	-	-	-	-
	(66 inch)	-	-	-	-	-	-	-	-	-	-	-	-	-
485N-905E	(36 inch)	-	-	-	-	-	-	-	-	-	-	-	-	-
	(66 inch)	-	-	-	-	-	-	-	-	-	-	-	-	-
586N-886E	(36 inch)	-	-	-	-	-	-	-	-	-	-	-	-	-
	(66 inch)	ND	ND	ND	0.01	0.02	0.01	ND	ND	0.15	ND	ND	0.42	6
680N-915E	(36 inch)	ND	0.03	0.05	0.01	0.03	ND	ND	ND	0.16	0.03	0.05	0.57	16
	(66 inch)	0.03	ND	ND	0.02	0.01	0.03	ND	ND	0.08	ND	0.02	0.83	18
780N-750E	(36 inch)	1.01	0.20	0.03	0.27	1.73	0.03	0.02	2.26	1.87	3.19	2.73	486.98	130
	(66 inch)	0.05	0.04	ND	ND	0.02	0.03	ND	ND	0.05	0.46	0.06	6.91	86
880N-850E	(36 inch)	0.06	0.03	0.05	0.01	0.04	0.02	0.10	ND	0.01	0.03	0.01	1.28	34
	(66 inch)	0.07	0.32	0.49	2.30	1.42	20.30	0.06	7.55	0.67	14.32	0.87	173.08	136
980N-800E	(36 inch)	17.50	0.55	0.15	0.25	0.63	0.05	0.01	4.25	0.58	6.17	1.47	75.04	126
	(66 inch)[e]													
1083N-877E	(36 inch)	0.01	0.01	ND	0.01	0.02	0.03	ND	ND	0.22	0.01	ND	0.53	16
	(66 inch)[e]													

[a]Estimated as toluene equivalent.
[b]VOST tube broken during sampling.
[c]No[illegible]ctable; less than the minimum detection limit of 0.01 microgr[illegible]er liter.
[d]Da[illegible]t collected because of analytical difficulty.
[e]Water encountered; sampling terminated.

AR300972

TABLE 2
COMPOUND CONCENTRATIONS FROM SOIL-GAS
SURVEY GRID SAMPLING (μg/ℓ)

SAMPLE NO.	X-COORD	Y-COORD	PLOTTING Y-COORD	VCM	TRANS	DCM	1,1DCA	CIS	MEK	THF	TCE	TOL	PERC	CHLORO	TOTAL
4110	-100	50	1,450	0	0	0	0	0	0	0	0	0	0	0	0.08
2305	0	-75	1,575	0	0	0	0	0	0	0	0	0	0	0	0.45
4072	0	100	1,400	0	0.33	0	0.03	0.26	0.02	0	0.23	0.11	0.44	0.88	173.7
4800	0	320	1,180	0	0.06	0	0	0	0.02	0	0	0.02	0.03	0.34	0.85
XXII	0	500	1,000	0	0.07	0	0	0.05	0.34	0	0	0.04	0.43	0.27	31.2
4113	0	700	800	1.31	0.46	0.02	0.33	3.24	0.07	0.02	6.47	6.23	18.12	3.21	550.19
4127	0	900	600	0	0	0	0	0	0	0	0	0	0	0	0.26
4368	0	1,300	200	0	0.09	0	0	0	0.02	0	0	0	2.2	0.54	1.81
1291	150	150	1,350	0	0	0	0	0	0	0	0	0	0	0	1.35
3793	200	500	1,000	0	0.07	0	0.45	0.05	0.04	0	0.02	0.27	0.05	0	3.6
3251	200	900	600	0	0.16	0.03	0	0.04	0	0	0	0.03	3.6	0.56	24.09
1669	200	1,100	400	0.16	0.08	0.03	0	1.53	0.02	0.02	0.08	0.82	3.91	0.65	157.32
4147	200	1,300	200	0	0.07	0	0	0	0.03	0	0	0.05	0.34	0.07	100.95
4152	400	0	1,500	0	0.06	0	0	0	0	0	0	0	0.02	0	1.03
4285	400	300	1,200	0	2.87	0	0	0.03	0	0	0	0.07	0.08	0	2.29
2267	400	500	1,000	1.87	0.42	0.03	0.19	4.22	0	0.03	0.58	0.7	4.5	0.59	110.77
4232	400	700	800	0.62	0.24	0.03	0	1.39	0.02	0.04	3.54	0.91	3.6	3.32	121.64
3448	400	900	600	0	0.78	0	0	0.04	0	0	0.04	0.05	0.61	0.32	53.59
3148	400	1,100	400	1.52	0.23	0.02	0	1.06	0	0.02	0.03	0	0.79	0.27	77.9
3608	400	1,300	200	0.87	0.02	0	0	1.26	0.15	0	0	0.23	0.86	0.36	33.58
1007	600	-100	1,600	0	0.03	0	0	0	0	0	0	0	0	0	0.28
3211	600	0	1,500	0	0	0	0	0	0	0	0	0	0	0	0.5
3660	600	100	1,400	0	0.06	0	0	0	0.03	0	0	0.03	0.02	0	0.65
896	600	200	1,300	0	0.5	0	0	0	0	0	0	0	0.47	0	0.56
3481	600	300	1,200	0	0.19	0	0	0	0	0	0	0	0	0	0.57
1293	600	400	1,100	0	0	0	0	0	0.68	0	0	0	0	0.13	17.28
468	600	500	1,000	0	0.07	0	0	0	0	0	0	0	0	0	0.28
3940	600	700	800	0	0	0	0	0	0	0	0	0	0.08	0.02	1.05
3902	600	800	700	0.08	0.48	0.02	0.25	4.26	0	0.03	0.69	0.95	1.78	0.47	251.07
3522	600	900	600	0.06	0.02	0	0	0.02	0.08	0.08	0.09	0.23	0.76	0.41	561.05
4169	600	1,500	0	0	0.08	0	0	0	0	0	0	0	0	0	0.27
3669	700	-100	1,600	0	0	0	0	0	0	0	0	0	0	0	0.33
4028	700	0	1,500	0	0	0	0	0	0	0	0	0	0.05	0	0.25
853	700	100	1,400	0	0	0	0	0	0	0	0	0	0	0	0.55
1882	700	200	1,300	0	0	0	0	0	0	0	0	0	0	0	0.24
4286	700	300	1,200	0	0	0	0	0	0	0	0	0	0	0	0.3
1002	700	500	1,000	0.29	0.09	0.75	1.25	0.02	0.02	0.56	0.1	0.39	0.55	0.09	37.29

TABLE 2
(Continued)

SAMPLE NO.	X-COORD	Y-COORD	PLOTTING Y-COORD	VCM	TRANS	DCM	1,1DCA	CIS	MEK	THF	TCE	TOL	PERC	CHLORO	TOTAL
4045	700	600	900	0.07	0.05	0.04	0.74	0	0	0.57	0.53	0.62	0.29	0.06	37.32
3998	700	700	800	0	0.28	0	0	0	0	0	0	0	0	0	0.27
1347	700	800	700	0.46	0.21	0	0	0.03	0.27	0	0.05	0.28	0.71	1.79	132.39
4355	700	900	600	0	0	0	0	0	0	0	0	0	0	0	0.31
4086	700	1,000	500	0	0	0	0	0	0	0	0	0	0	0	0.29
4254	700	1,100	400	0	0.06	0	0	0	0	0	0.02	0	0.02	0	0.91
1086	800	0	1,500	0	0.23	0	0	0	0.02	0	0	0	0.02	0.6	1.34
1192	800	100	1,400	0.78	0	0	0	0.05	0.02	0	0	0.04	0.8	0.07	15.48
1908	800	200	1,300	0.02	0	0	0	0	0	0	0	0	0.07	0.07	2.7
3396	800	300	1,200	0	0.18	0	0	0	0	0	0	0	0	0	1
1835	800	400	1,100	0	0	0	0	0	0.04	0	0	0	0.34	0	1.13
3617	800	500	1,000	0	0.03	0	0	0	0	0	0	0	0.03	0	1.48
3263	800	600	900	0	0	0	0	0	0	0	0	0	0	0	0.36
3896	800	700	800	0	0	0	0	0	0	0	0	0	0.02	0	0.85
3	800	800	700	0.27	0.49	0.03	0.22	2.95	0.02	0.03	0.47	1.24	2.58	0.45	129.38
3501	800	900	600	0.14	0.47	0	0.24	4.05	0.02	0.02	1.11	0.45	1.55	0.51	358.82
4242	800	1,100	400	0	0.02	0	0	0	0	0	0	0	0	0	1.05
3277	800	1,400	100	0	0.26	0	0	0.02	0	0	0	0	0.02	0.24	0.72
3948	860	800	700	0	0	0	0	0	0.05	0.02	0.04	0.22	0.08	0.05	7.91
3338	880	280	1,220	0	0	0	0	0	0	0	0	0	0	0	0.09
3075	880	400	1,100	0.04	0.09	0	0	1.06	0.03	0	0.03	0.21	1.34	0.6	47.57
4165	900	-100	1,600	0	0.03	0	0	0	0	0	0	0	0	0	0.51
97	900	0	1,500	0	0	0	0	0	0	0	0	0	0.04	0	1.05
3969	900	100	1,400	0	0	0	0	0	0	0	0	0	0	0	0.02
4251	900	200	1,300	0	0.22	0	0	0	0	0	0	0	0	0	1.87
2407	900	300	1,200	0.11	0.03	0	0	1.37	0.14	0.07	0.09	0.08	0.35	0.06	27.07
3000	900	400	1,100	0.13	0.15	0	0	0.07	0.03	0	0.04	0.02	0.36	0.24	13.52
1654	900	600	900	0.36	0	0	0	0	0	0	0	0	0.43	0.03	1.61
3992	900	800	700	0	0.02	0	0	0	0	0	0	0	0.03	0	0.85
4267	900	900	600	0	0	0	0	0	0	0	0	0	0	0.02	0.42
1855	900	1,000	500	0.12	0	0.07	0.36	0.02	0	0.02	0.36	0.21	0.07	1.59	22.3
3380	900	1,100	400	0	0	0	0	0	0	0	0	0	0.05	0	0.72
3564	950	950	550	0	0	0	0	0	0	0	0	0	0	0	0.63
3573	1,000	-100	1,600	0	0.14	0	0	0	0	0	0	0	0	0	0.8
1867	1,000	0	1,500	0	0	0	0	0	0	0	0	0	0	0	1.59
2268	1,000	100	1,400	0	0	0	0	0	0	0	0	0	0.03	0	0.69
5252	1,000	200	1,300	0	0.02	0	0	0	0	0	0	0	0.51	1.54	1.8
4370	1,000	300	1,200	0	0.02	0	0	0	0	0	0	0	0.03	0.57	2.26

AR300974

TABLE 2
(Continued)

SAMPLE NO.	X-COORD	Y-COORD	PLOTTING Y-COORD	VCM	TRANS	DCM	1,1DCA	CIS	MEK	THF	TCE	TOL	PERC	CHLORO	TOTAL
1638	1,000	500	1,000	0	0	0	0	0	0	0	0	0	0	0	0.25
822	1,000	600	900	0	0.22	0	0	0	0	0	0	0	0.05	0	0.44
1A	1,000	800	700	0	0	0	0	0	0	0	0	0	0.02	0	0.99
4290	1,000	900	600	0	0	0	0	0	0.02	0	0	0	0	0.35	0.84
2166	1,000	1,000	500	0	0.02	0	0	0	0	0	0	0	0.02	0	0.76
4342	1,000	1,200	300	0	0	0	0	0	0	0	0	0	0.02	0	0.51
3824	1,100	0	1,500	0	0.75	0	0	0	0	0	0	0	0.03	0.05	1.83
4270	1,100	100	1,400	0	0.02	0	0	0	0	0	0	0	0	0	0.37
3006	1,100	200	1,300	0	0.03	0	0	0	0	0	0	0	0	0.02	0.41
4066	1,100	300	1,200	0	0.03	0	0	0	0.02	0	0	0.02	0.38	0.33	0.89
1887	1,100	400	1,100	0	0	0	0	0	0	0	0	0	0	0	2.35
4071	1,100	500	1,000	0	0.02	0	0	0	0.04	0	0	0	0.02	0.05	1.26
4074	1,100	600	900	0	0.8	0	0	0	0	0	0	0.02	0.02	0	1.36
2430	1,100	700	800	0	0	0	0	0	0	0	0	0	0	0	0.17
3409	1,100	800	700	0	0.05	0	0	0	0	0	0	0	0.03	0	0.41
4271	1,100	900	600	0	0	0	0	0	0	0	0	0	0	0	0.19
4253	1,100	1,000	500	0	0.07	0	0	0.03	0	0	0	0.03	0.06	0	1.62
112	1,100	1,100	400	0	0	0	0	0	0	0	0	0	0.03	0	0.31
1838	1,200	100	1,400	0.02	0.6	0	0	0	0	0	0	0	0.05	0	0.71
3847	1,200	200	1,300	0	0.82	0	0	0	0	0	0	0	0	0.03	0.38
4180	1,200	300	1,200	0	0	0	0	0	0	0	0	0	0.36	0.28	0.69
2120	1,200	400	1,100	0	0	0	0	0	0	0	0	0	0	0.35	24.93
4108	1,200	500	1,000	0	0.02	0	0	0	0	0	0	0	0	0	0.4
4184	1,200	600	900	0.05	0	0	0	0.02	0	0.02	0	0.03	0.34	0	1.71
3868	1,200	700	800	0	0.08	0	0	0	0	0	0	0	0	0.34	0.8
4268	1,200	800	700	0.09	0.03	0	0	0.02	0.02	0.05	0.02	0.02	0.07	0.03	2.81
2265	1,200	900	600	0	0.02	0	0	0.02	0.04	0	0	0.03	0.02	0	1.69
4350	1,200	1,000	500	0	0	0	0	0	0	0	0	0	0	0	8.75
1752	1,200	1,100	400	0	0.42	0	0	0	0.02	0	0	0.02	0.29	0.02	1.31
4292	1,200	1,200	300	0	0	0	0	0	0	0	0	0	0	0	0.38
4263	1,300	600	900	0	0	0	0	0	0	0	0	0	0	0	0.19
3835	1,400	300	1,200	0	0	0	0	0	0	0	0	0	0	0	0.33
4288	1,400	500	1,000	0	0.02	0	0	0	0.02	0	0	0	0.02	0	0.84

NOTES:

1. Concentrations are measured in microliters/liter.
2. Totals calculated as toluene equivalents.

TABLE 3

COMPOUND CONCENTRATIONS FROM SOIL-GAS SURVEY SCREENING (ppm)

DATE	TIME	CONCENTRATION ABOVE BACKGROUND	LOCATION
8/23	1430	100	150N, 150E
8/23	1515	34.5	220N, 200E
8/23	1645	8.0	520N, 020E
8/23	1710	0.0	70N, 450E
8/24	0810	35.4	-80N, 950E
8/24	0845	35.4	50N, 850E
8/24	0930	72.2	130N, 620E
8/24	1000	17.2	280N, 900E
8/24	1050	117.3	300N, 630E
8/24	1220	0.0	440N, 800E
8/24	-[a]	-	600N, 1000E
8/26	0740	4.5	50N, -100E
8/26	0815	3.2	1000N, 400E
8/26	0820	8.0	100N, 370E
8/26	0830	4.8	Located in depression in SW sector of cells B/C. Soil is brown, moist sand.
8/26	0845	5.6	Located in a depression. Soil, wet sandy clay.
8/26	0900	0.0	Located in a small depression. Soil is black, wet, sandy.

[a]No reading taken due to perched water in close proximity to the ground surface.

TABLE 4

COMPOUND CONCENTRATIONS FROM SOIL-GAS SURVEY GC/MS DUPLICATES

ANALYTE CONCENTRATION, TOTAL Ng

GC/FID Sample No.:	3608	1291	4110	Field Blank
GC/MS Sample No.:	3444	12	4027	90
Lab Sample No.:	-01	-02	-03	-04
Analyte				
2-butanone (MEK)	ND	ND	ND	ND
Dichloromethane	30	130	36	80
Chlorobenzene	ND	ND	ND	ND
1,1-Dichloroethane	ND	ND	ND	ND
cis-1,2-Dichloroethylene	ND	ND	ND	ND
trans-1,2-Dichloroethylene	9	ND	ND	ND
Tetrahydrofuran	ND	ND	ND	ND
Tetrachloroethane (PERC)	ND	ND	ND	ND
Toluene	ND	ND	ND	ND
Trichloroethene	ND	ND	ND	ND
Vinyl chloride	ND	ND	ND	ND

GC/FID Sample No.:	2267	1007	1908	3896
GC/MS Sample No.:	4165	589	3663	1994
Lab Sample No.:	-07	-08	-09	-10
Analyte				
2-butanone (MEK)	ND	ND	ND	ND
Dichloromethane	ND	69	87	73
Chlorobenzene	ND	ND	ND	ND
1,1-Dichloroethane	120	ND	ND	ND
cis-1,2-Dichloroethylene	ND	ND	ND	ND
trans-1,2-Dichloroethylene	29	ND	ND	ND
Tetrahydrofuran	ND	ND	ND	ND
Tetrachloroethane (PERC)	110	ND	ND	ND
Toluene	ND	ND	ND	ND
Trichloroethene	ND	ND	ND	ND
Vinyl chloride	2,700	ND	ND	ND

TABLE 4
(Continued)

GC/FID Sample No.:	4086	3573	2120	3409
GC/MS Sample No.:	3926	3042	1429	2322
Lab Sample No.:	-11	-12	-13	-14
Analyte				
2-butanone (MEK)	ND	ND	ND	ND
Dichloromethane	200	98	480	74
Chlorobenzene	ND	18	ND	ND
1,1-Dichloroethane	2,000	ND	ND	ND
cis-1,2-Dichloroethylene	ND	ND	ND	ND
trans-1,2-Dichloroethylene	38	ND	ND	ND
Tetrahydrofuran	ND	ND	ND	ND
Tetrachloroethane (PERC)	33	ND	ND	ND
Toluene	220	7	ND	ND
Trichloroethene	87	ND	ND	ND
Vinyl chloride	ND	ND	ND	ND

GC/FID Sample No.:	4342	4113	--	--
GC/MS Sample No.:	4241	4280	BLANK	DETECTION
Lab Sample No.:	-15	016	VBLK0918	LIMIT, Ng
Analyte				
2-butanone (MEK)	ND	ND	ND	<10
Dichloromethane	97	240	34	<5
Chlorobenzene	ND	3,000	ND	<5
1,1-Dichloroethane	ND	84	ND	<5
cis-1,2-Dichloroethylene	ND	ND	ND	<5
trans-1,2-Dichloroethylene	ND	180	ND	<5
Tetrahydrofuran	ND	ND	ND	<5
Tetrachloroethane (PERC)	ND	36	ND	<5
Toluene	9	7,200	ND	<5
Trichloroethene	ND	140	ND	<5
Vinyl chloride	ND	1,700	ND	<5

TABLE 5

MATRIX SPIKE RECOVERY PERCENTAGES FROM SOIL-GAS PRELIMINARY TESTING (%)[a]

SAMPLE NUMBER	VCM	TRANS 1,2-DCE	DCM	1,1-DCA	CIS 1,2-DCE	MEK	THF	TCE	TOLUENE	PERC	CHLORO-BENZENE
1809	12.3	270	69.0	84.7	255	102	74.2	49.3	--[b]	--	--
4057	6.3	229	60.3	77.8	217	86.7	68.0	44.1	55.2	68.4	51.1

[a]Spiked at 1.00 μg each target compound/liter of gas.

[b]No data collected because of analytical difficulty.

TABLE 6

MATRIX SPIKE RECOVERY PERCENTAGES FROM SOIL-GAS SURVEY GRID SAMPLING (%)

SAMPLE NO.	VCM	TRANS	DCM	1,1DCA	CIS	MEK	THF	TCE	TOL	PERC	CHLORO
CONCENTRATION EQUALS 10 TIMES DETECTION LIMIT											
4304[a]	-	-	-	-	-	-	-	-	-	-	-
4304 dup.	<10	10	10	10	20	10	10	30	20	30	20
4265	<10	70	70	70	70	50	70	10	10	70	70
4265 dup.	<10	10	40	20	50	80	20	40	10	50	150
CONCENTRATION EQUALS 100 TIMES DETECTION LIMIT											
3452	34	67	25	61	118	40	55	14	69	66	56
3452 dup.	3	3	2	30	3	8	8	14	8	43	90
4256	22	68	17	54	59	15	55	22	47	56	48
4256 dup.	3	3	2	13	2	8	6	16	7	34	58
CONCENTRATION EQUALS 1000 TIMES DETECTION LIMIT											
1983	55	85	74	76	287	209	68	40	92	98	78
1983 dup.	5	3	3	5	3	4	6	1	7	8	6
3745	40	51	39	39	163	89	38	25	45	38	33
3745 dup.	7	3	2	5	2	2	6	2	8	15	1

[a]Indicates sample not analyzed due to breakage.

COMMENTS:

1. Generally low recoveries. VCM not recovered at 10x detection limit.
2. Poor precision between duplicate samples.
3. Poor precision may be result of potential leakage in dual syringe sampler. This sampler was not utilized except for matrix spike sampling. An identical dual syringe sampler collected samples for GC/MS. These data had better precision.
4. Because excellent recoveries and high precision are routinely documented in laboratory (over holding times of 3 weeks) prepared spikes, poor field data may be the result of field conditions (i.e., lack of temperature control and ultra-violet radiation [double-bonded compounds are more sensitive]).

TABLE 7

RINSATE BLANK CONCENTRATIONS FROM SOIL-GAS SURVEY PRELIMINARY TESTING (μg/ℓ)

SAMPLE NUMBER	VCM	TRANS 1,2-DCE	DCM	1,1-DCA	CIS 1,2-DCE	MEK	THF	TCE	TOLUENE	PERC	CHLORO-BENZENE	TOTAL VOLATILES[a]
2083[b]	ND[c]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
487[d]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

[a]Estimated as toluene equivalent.
[b]Collected before sampling.
[c]Nondetectable; less than minimum detection limit of 0.01 microgram/liter.
[d]Collected during sampling.

TABLE 8

RINSATE BLANK CONCENTRATIONS FROM SOIL-GAS SURVEY GRID SAMPLING (μg/ℓ)

SAMPLE NO.	VCM	TRANS	DCM	1,1DCA	CIS	MEK	THF	TCE	TOL	PERC	CHLORO	TOTAL
4297	0	0	0	0	0	0	0	0	0	0	0	1.00
3830	0	0.11	0	0	0	0	0	0	0	0	0	0.78
3321	0	0	0	0	0	0	0	0	0	0	0	1.69
3154	0	0	0	0	0	0	0	0	0	0	0	0.33
3120	0	0	0	0	0	0	0	0	0	0	0	0.17
4243	0	0	0	0	0	0	0	0	0	0	0	0.16
4252	0	0	0	0	0	0	0	0	0	0	0	0.22
2400	0	0	0	0	0	0	0	0	0	0	0	0.18
4250	0	0	0	0	0	0	0	0	0	0	0	0.21
4317	0	0	0	0	0	0	0	0	0	0	0	0.2
3023	0	0	0	0	0	0	0	0	0	0	0	0.31
4336[a]	-	-	-	-	-	-	-	-	-	-	-	-

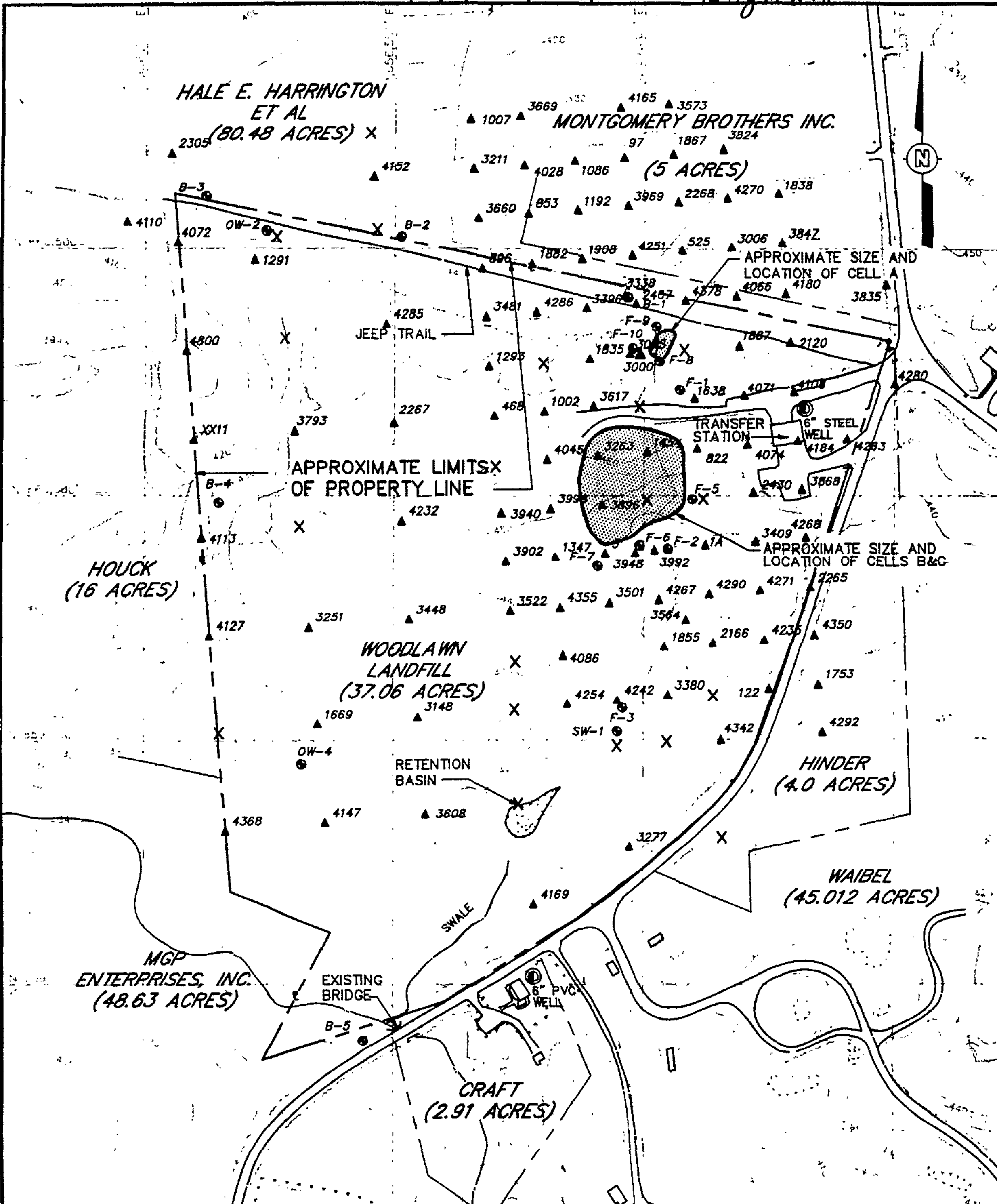
[a]Sample not analyzed due to breakage.

COMMENTS: 1. Data indicates decon procedures adequate.

FIGURES

FIGURES

50% 7B BLK 7B	DRAWN BY	GSJ 9-28-89	CHECKED BY APPROVED BY			DRAWING NUMBER 303486-B38



LEGEND

F-2 MONITORING WELL INSTALLED BY FIRESTONE

SW-1 MONITORING WELL INSTALLED BY CECIL COUNTY

B-4 MONITORING WELL INSTALLED BY THE STATE OF MARYLAND

BEDROCK WELL (LOCATION APPROXIMATE)

3251 SAMPLE LOCATIONS

LOCATION WHERE SAMPLE WAS LOST

SCALE

0 200 400 FEET

FIGURE 1

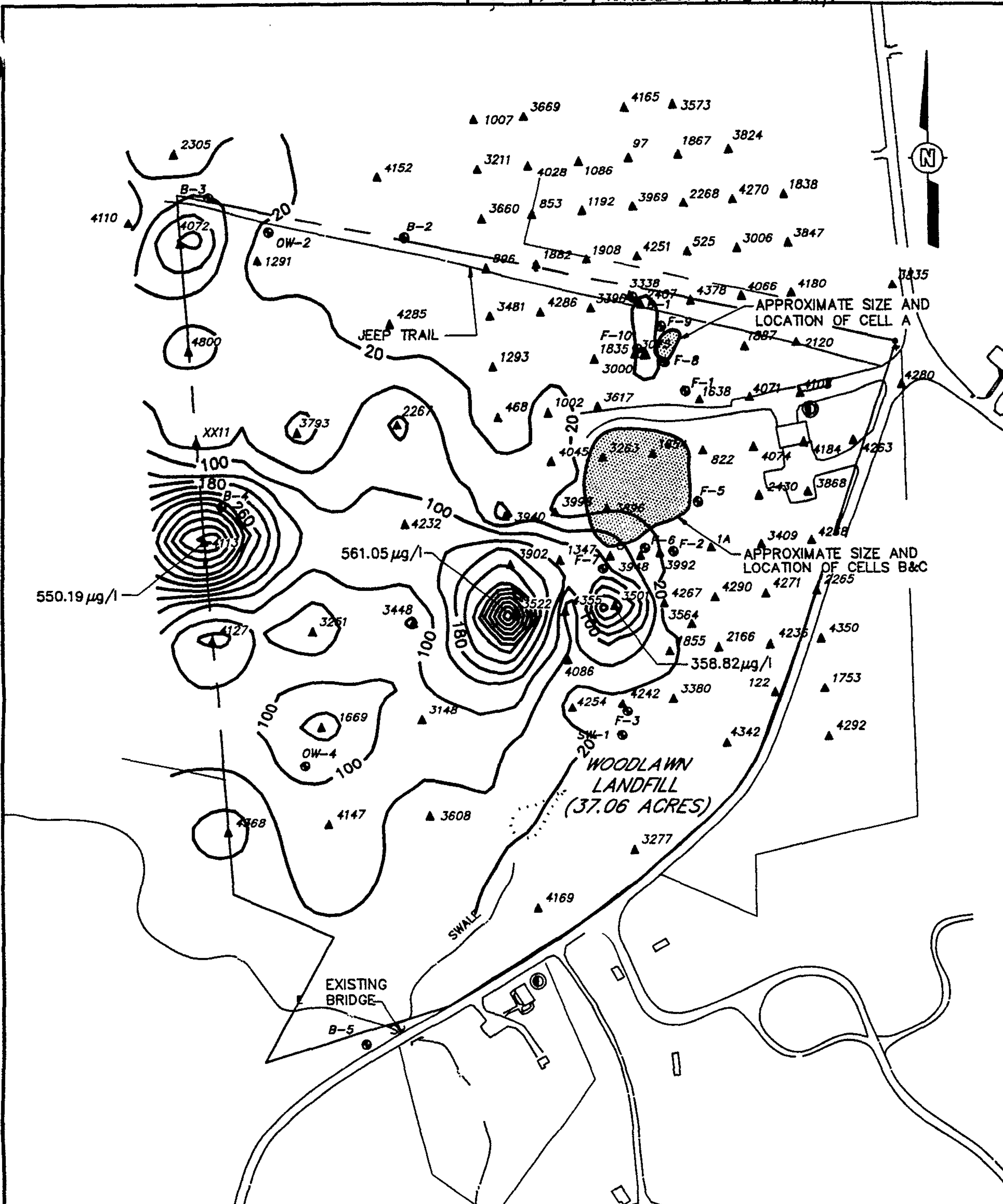
SOIL-GAS SAMPLE LOCATIONS

PREPARED FOR

WOODLAWN LANDFILL RI/FS

INTERNATIONAL TECHNOLOGY CORPORATION

DRAWN BY	GSJ 9/28/89	CHECKED BY / APPROVED BY	WUS / QMJ	11/30/89	DRAWING NUMBER 303486-B44



LEGEND

F-2 MONITORING WELL INSTALLED BY FIRESTONE

SW-1 MONITORING WELL INSTALLED BY CECIL COUNTY

B-4 MONITORING WELL INSTALLED BY THE STATE OF MARYLAND

BEDROCK WELL (LOCATION APPROXIMATE)

3251 SAMPLE LOCATIONS

20 ISOPLETH (CONTOUR INTERVAL – 40 MICROGRAMS PER LITER)

SCALE 0 200 400 FEET

FIGURE 2

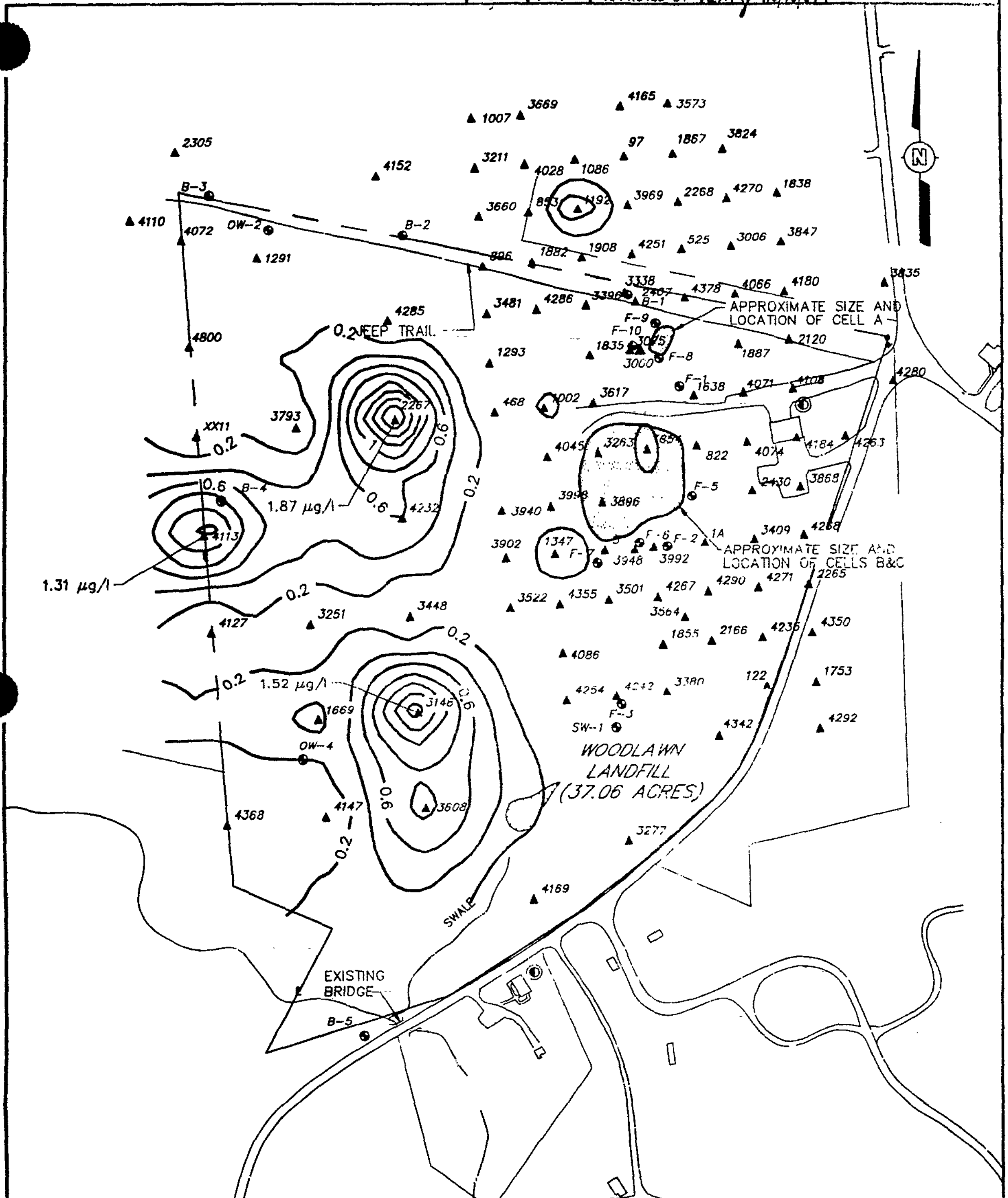
SOIL-GAS ISOPLETH MAP OF TOTAL VOCs (TOLUENE EQUIV.)

PREPARED FOR

WOODLAWN LANDFILL RI/FS

INTERNATIONAL TECHNOLOGY CORPORATION

DRAWN BY	GSJ 9/28/89	CHECKED BY / APPROVED BY			DRAWING NUMBER 303486_B53



LEGEND

F-2 MONITORING WELL INSTALLED BY FIRESTONE

SW-1 MONITORING WELL INSTALLED BY CECIL COUNTY

B-6 MONITORING WELL INSTALLED BY THE STATE OF MARYLAND

BEDROCK WELL (LOCATION APPROXIMATE)

3251 SAMPLE LOCATIONS

0.2 ISOPLETH (CONTOUR INTERVAL - 0.2 MICROGRAMS PER LITER)

SCALE

0 200 400 FEET

FIGURE 3

SOIL-GAS ISOPLETH MAP OF VINYL CHLORIDE MONOMER

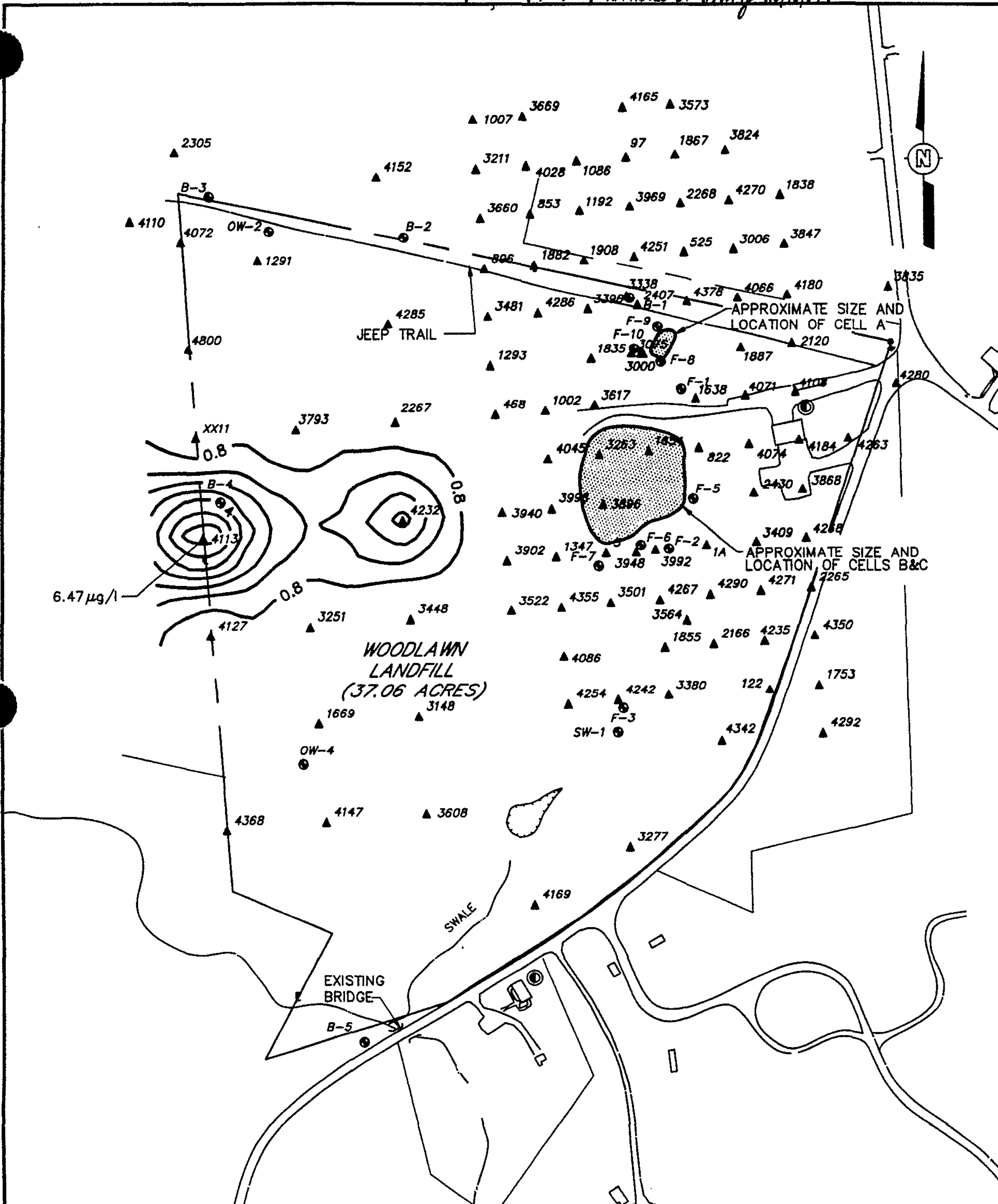
PREPARED FOR

WOODLAWN LANDFILL RI/FS

INTERNATIONAL TECHNOLOGY CORPORATION

132288

DRAWN BY	GST 9/28/89	CHECKED BY			DRAWING NUMBER 303486-B46
		APPROVED BY			



LEGEND

F-2 MONITORING WELL INSTALLED BY FIRESTONE

SW-1 MONITORING WELL INSTALLED BY CECIL COUNTY

B-6 MONITORING WELL INSTALLED BY THE STATE OF MARYLAND

BEDROCK WELL (LOCATION APPROXIMATE)

3251 SAMPLE LOCATIONS

ISOPLETH (CONTOUR INTERVAL – 0.8 MICROGRAMS PER LITER)

SCALE
0 200 400 FEET

FIGURE 4

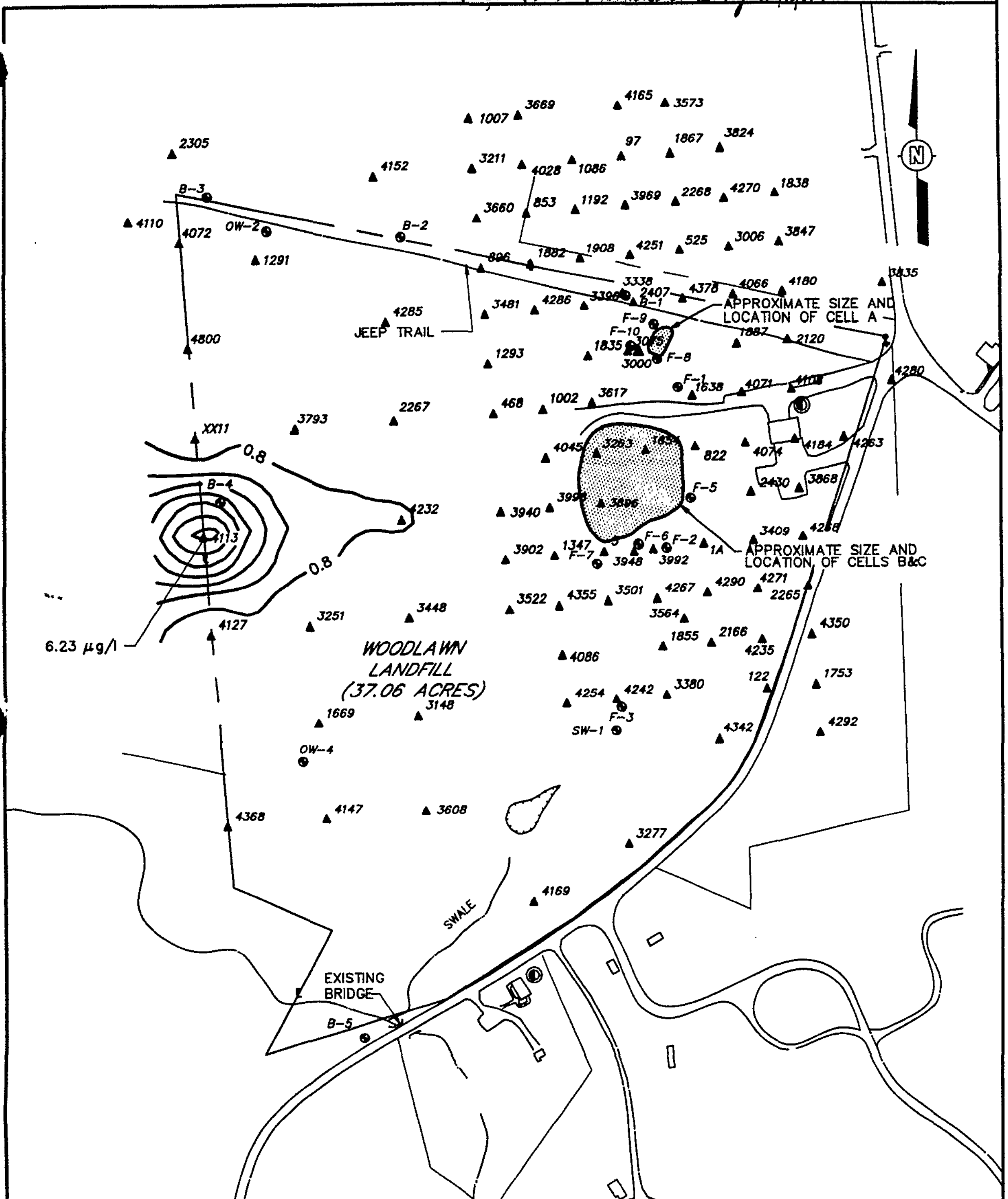
SOIL-GAS ISOPLETH MAP OF TRICHLOROETHYLENE

PREPARED FOR

WOODLAWN LANDFILL RI/FS

INTERNATIONAL TECHNOLOGY CORPORATION

DRAWN BY	GSJ 9/28/89	CHECKED BY		10/10/89	DRAWING NUMBER 303486-B47
		APPROVED BY		10/10/89	



LEGEND

F-2 MONITORING WELL INSTALLED BY FIRESTONE

SW-1 MONITORING WELL INSTALLED BY CECIL COUNTY

B-6 MONITORING WELL INSTALLED BY THE STATE OF MARYLAND

BEDROCK WELL (LOCATION APPROXIMATE)

3251 SAMPLE LOCATIONS

ISOPLETH (CONTOUR INTERVAL – 0.8 MICROGRAM PER LITER)

SCALE

0 200 400 FEET

FIGURE 5

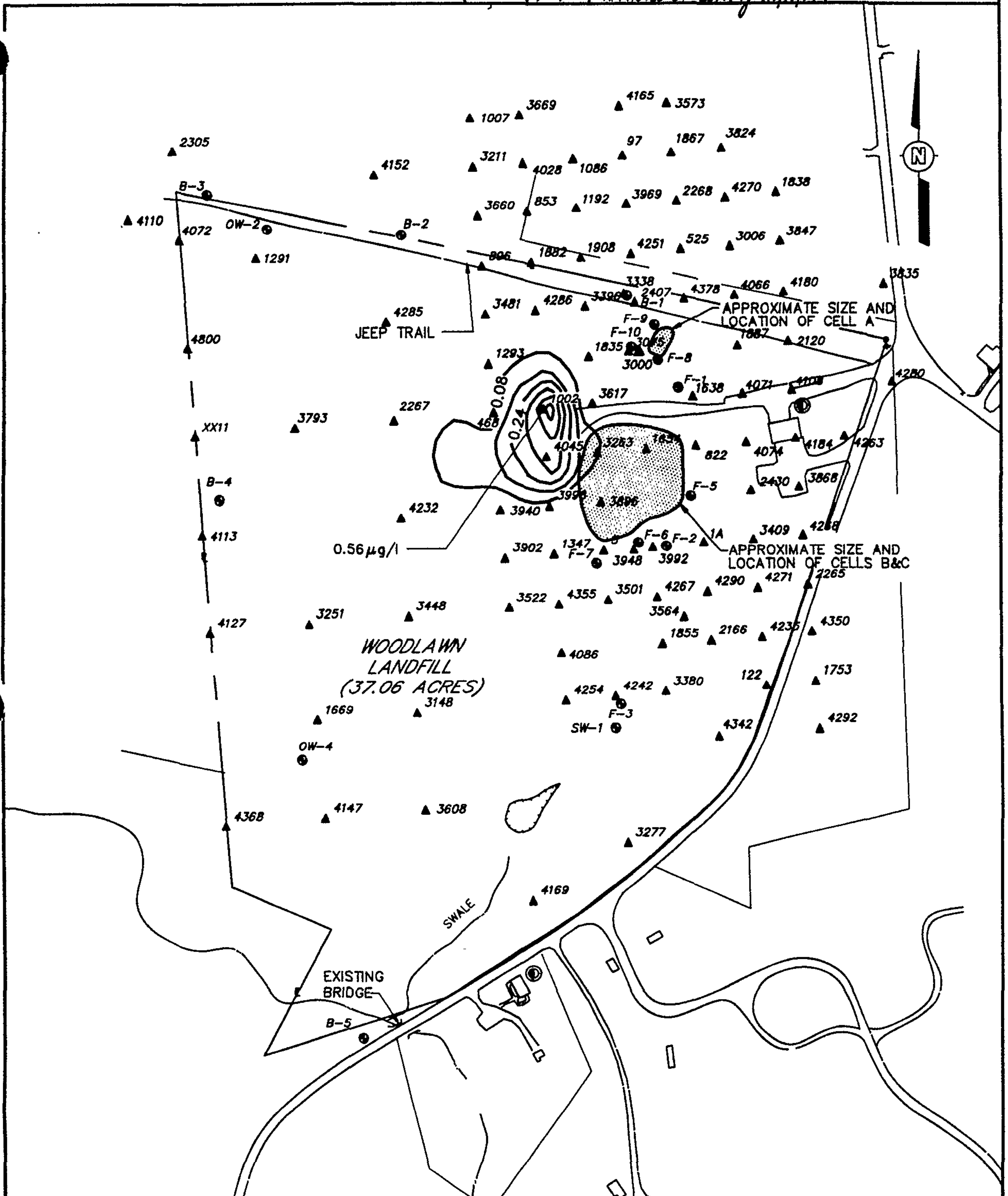
SOIL-GAS ISOPLETH MAP OF TOLUENE

PREPARED FOR

WOODLAWN LANDFILL RI/FS

INTERNATIONAL TECHNOLOGY CORPORATION

DRAWN BY	GSJ 9/28/89	CHECKED BY / APPROVED BY		10/10/89	DRAWING NUMBER 303486-B45



LEGEND

- F-2 — MONITORING WELL INSTALLED BY FIRESTONE
- SW-1 — MONITORING WELL INSTALLED BY CECIL COUNTY
- B-6 — MONITORING WELL INSTALLED BY THE STATE OF MARYLAND
- BEDROCK WELL (LOCATION APPROXIMATE)
- SAMPLE LOCATIONS
- 0.08 — ISOPLETH (CONTOUR INTERVAL – 0.08 MICROGRAMS PER LITER)

SCALE

0 200 400 FEET

FIGURE 6

SOIL-GAS ISOPLETH MAP OF TETRAHYDROFURAN

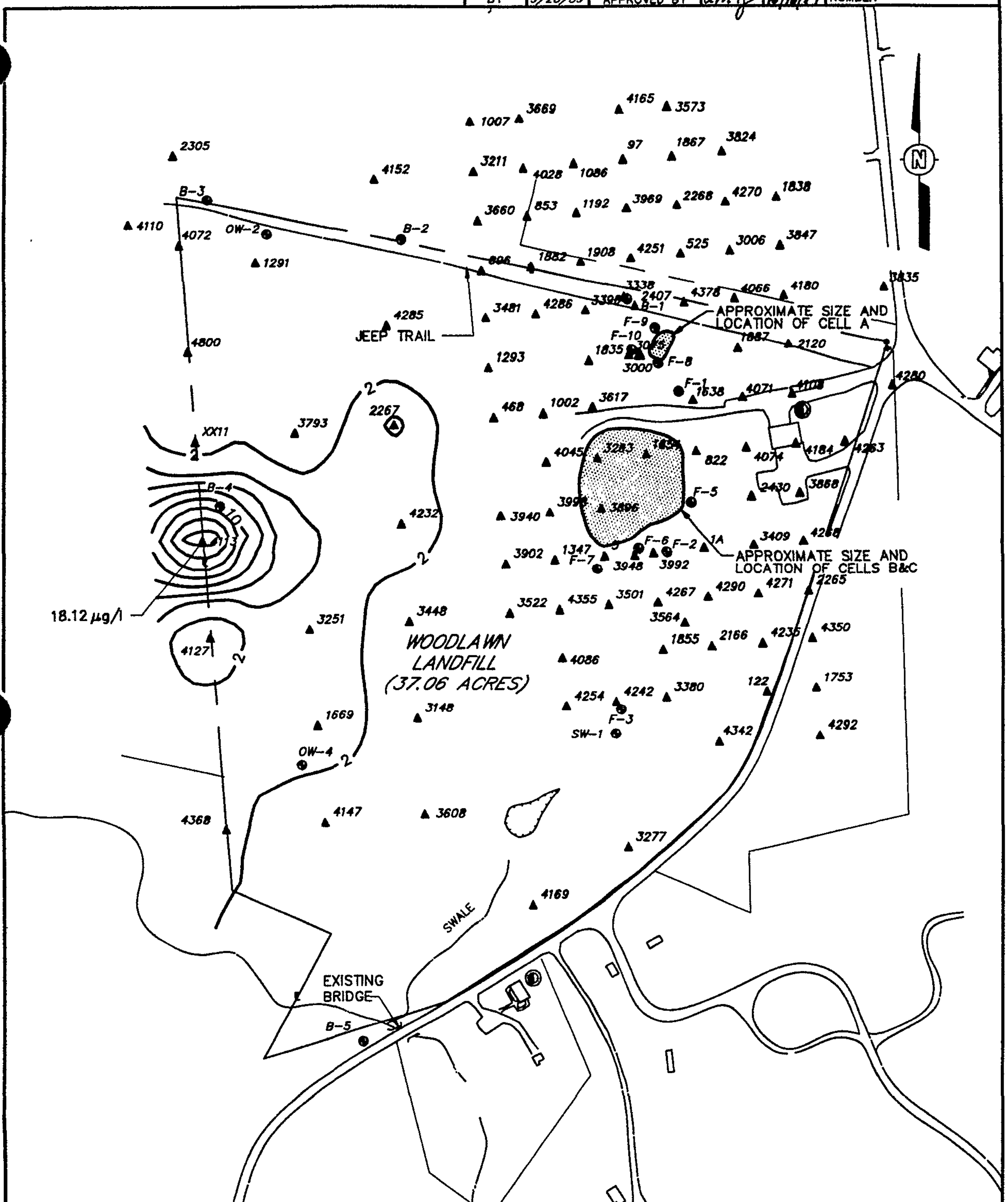
PREPARED FOR

WOODLAWN LANDFILL RI/FS

INTERNATIONAL TECHNOLOGY CORPORATION

AR300990

DRAWN BY	GSJ 9/28/89	CHECKED BY	MKD	10/ /89	DRAWING NUMBER 303486-B42
		APPROVED BY		10/10/89	



LEGEND

- F-2 MONITORING WELL INSTALLED BY FIRESTONE
- SW-1 MONITORING WELL INSTALLED BY CECIL COUNTY
- B-6 MONITORING WELL INSTALLED BY THE STATE OF MARYLAND
- BEDROCK WELL (LOCATION APPROXIMATE)
- 3251 SAMPLE LOCATIONS
- ISOPLETH (CONTOUR INTERVAL – 2 MICROGRAMS PER LITER)

SCALE
0 200 400 FEET

FIGURE 7

SOIL-GAS ISOPLETH MAP OF TETRACHLOROETHYLENE

PREPARED FOR

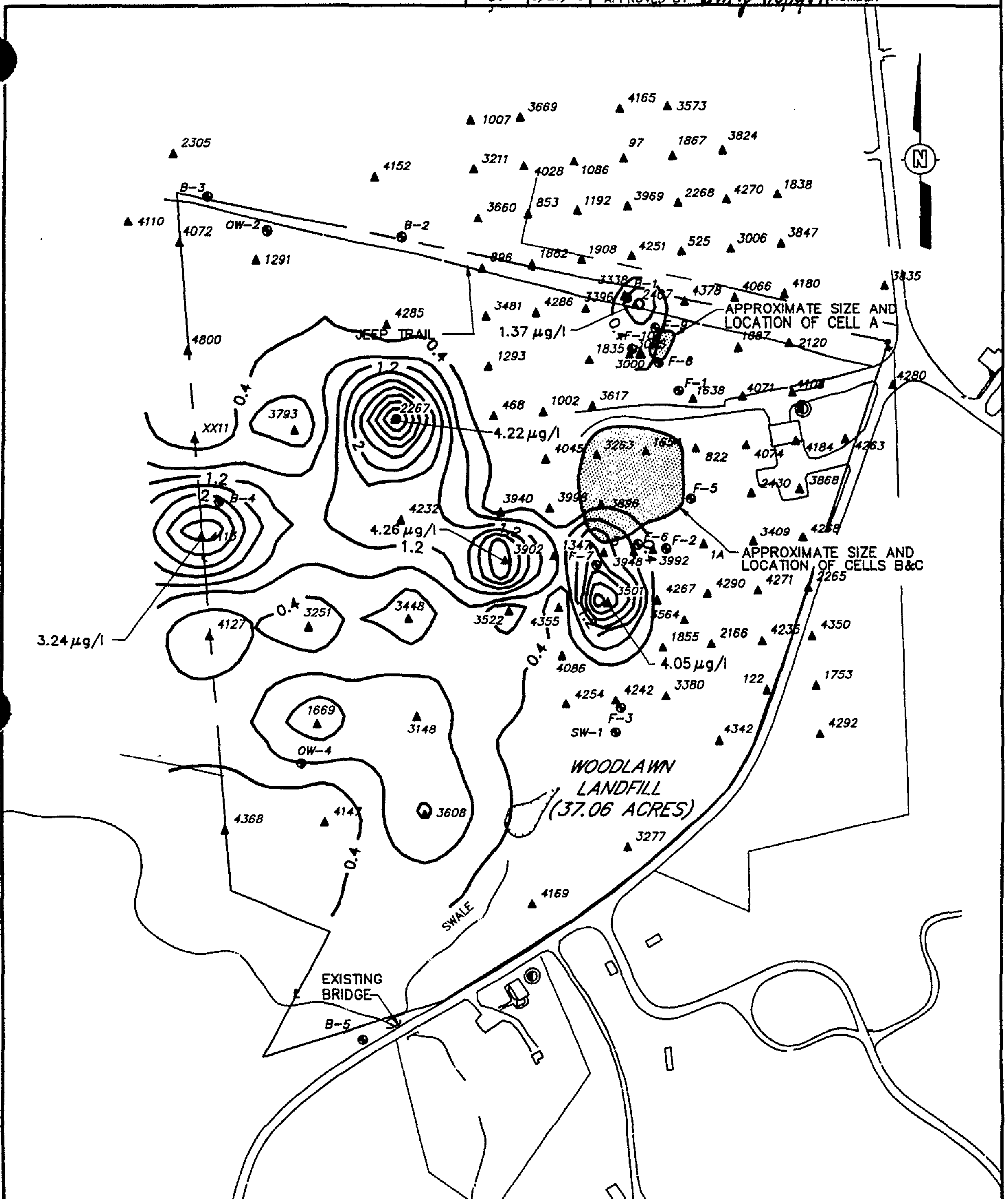
WOODLAWN LANDFILL RI/FS

INTERNATIONAL TECHNOLOGY CORPORATION

132295

AR300991

DRAWN BY	GSJ 9/28/89	CHECKED BY	MKB	10/10/89	DRAWING NUMBER 303486-B49
		APPROVED BY	amy	10/10/89	



LEGEND

F-2 MONITORING WELL INSTALLED BY FIRESTONE

SW-1 MONITORING WELL INSTALLED BY CECIL COUNTY

B-6 MONITORING WELL INSTALLED BY THE STATE OF MARYLAND

BEDROCK WELL (LOCATION APPROXIMATE)

3251 SAMPLE LOCATIONS

ISOPLETH (CONTOUR INTERVAL – 0.4 MICROGRAMS PER LITER)

SCALE 0 200 400 FEET

FIGURE 8

SOIL-GAS ISOPLETH MAP OF CIS 1,2 -DICHLOROETHYLENE

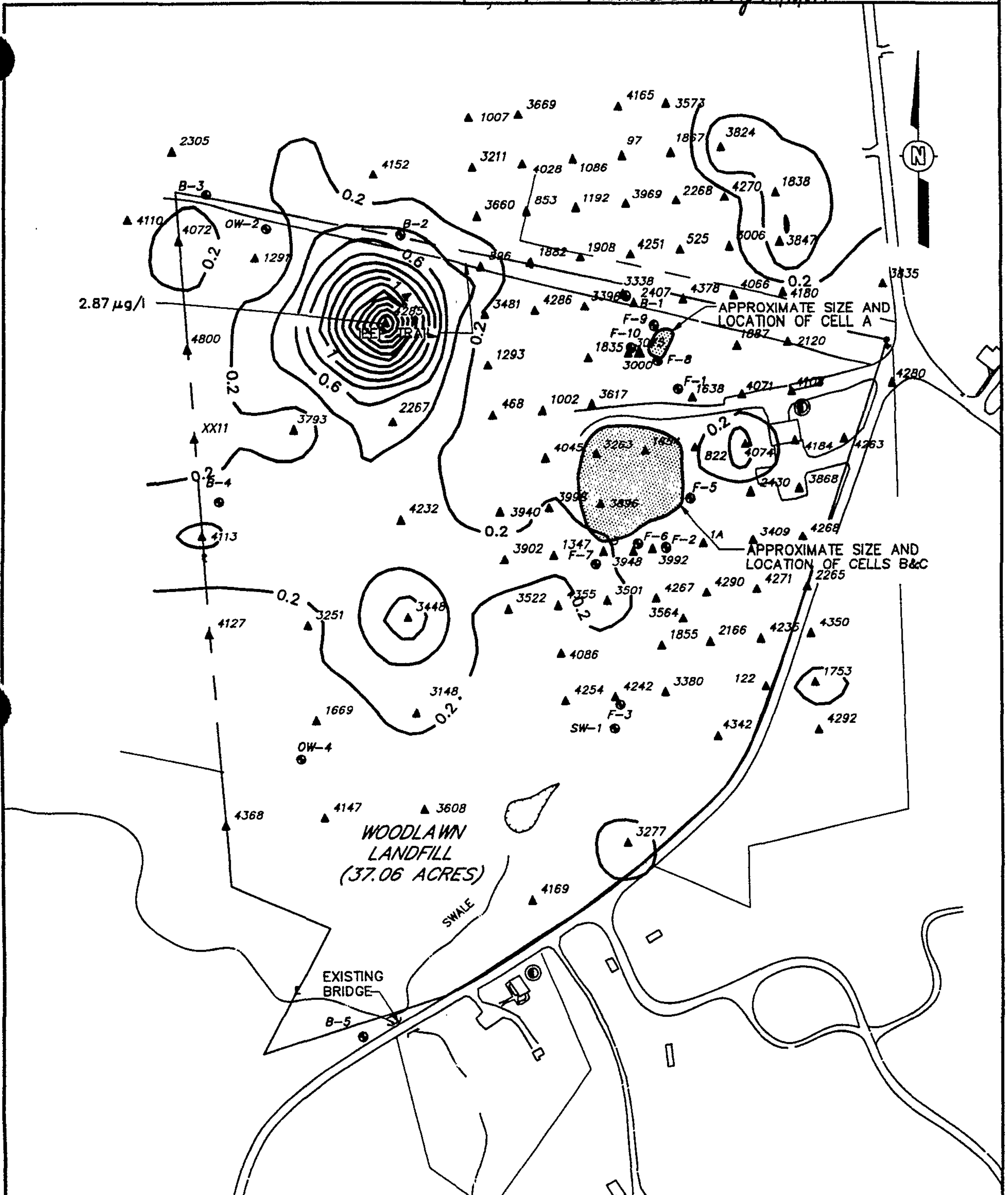
PREPARED FOR

WOODLAWN LANDFILL RI/FS

INTERNATIONAL TECHNOLOGY CORPORATION

AR300992

DRAWN BY	GSJ 9/28/89	CHECKED BY		10/10/89	DRAWING NUMBER 303486-B51
		APPROVED BY		10/10/89	



LEGEND

F-2 MONITORING WELL INSTALLED BY FIRESTONE

SW-1 MONITORING WELL INSTALLED BY CECIL COUNTY

B-6 MONITORING WELL INSTALLED BY THE STATE OF MARYLAND

BEDROCK WELL (LOCATION APPROXIMATE)

3251 SAMPLE LOCATIONS

ISOPLETH (CONTOUR INTERVAL – 0.2 MICROGRAMS PER LITER)

SCALE 0 200 400 FEET

FIGURE 9

SOIL-GAS ISOPLETH MAP OF TRANS 1,2-DICHLOROETHYLENE

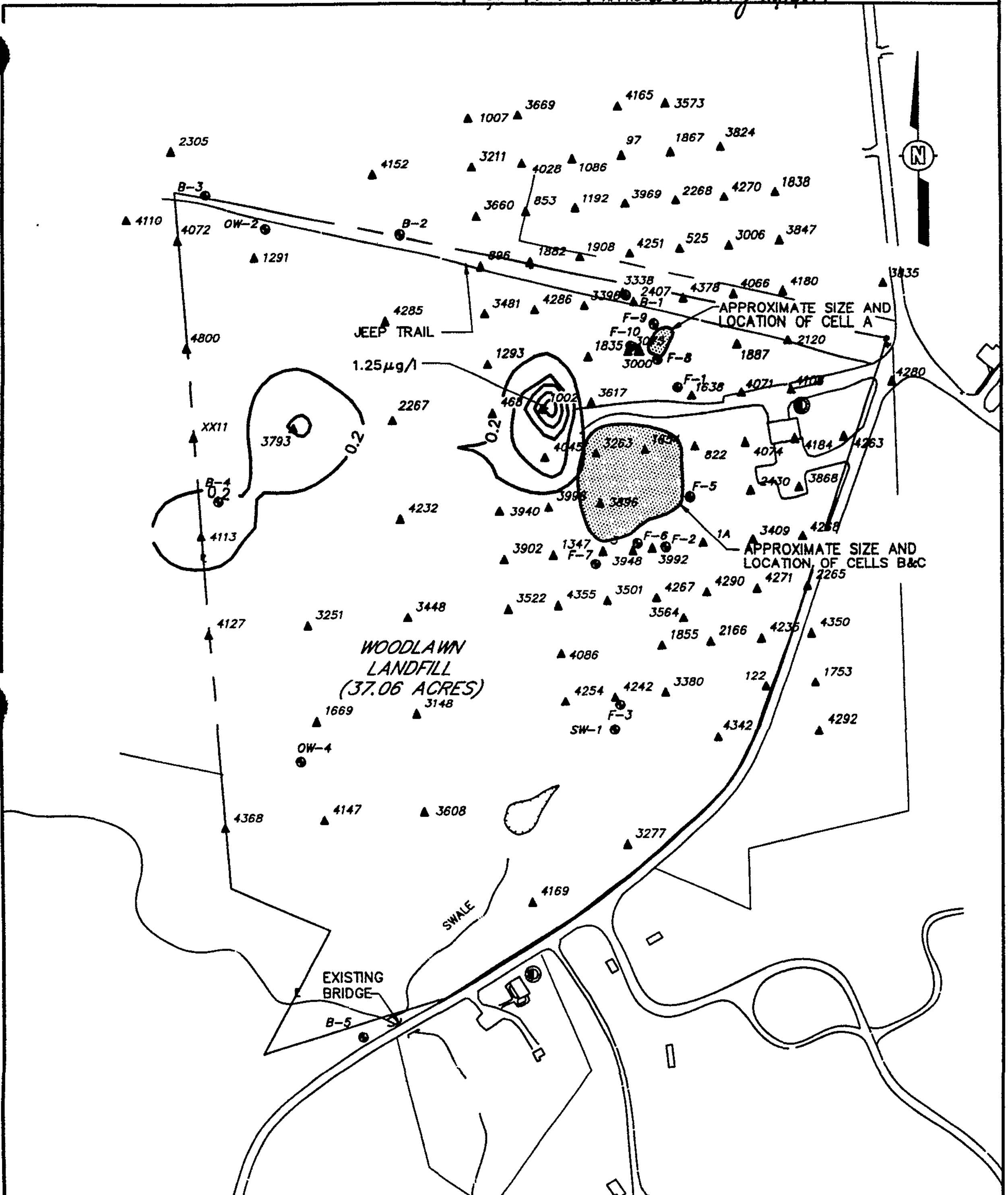
PREPARED FOR

WOODLAWN LANDFILL RI/FS

INTERNATIONAL TECHNOLOGY CORPORATION

132298

DRAWN BY	GSJ 9/28/89	CHECKED BY	MKD		DRAWING NUMBER	303486-B48
		APPROVED BY				



LEGEND

- F-2 MONITORING WELL INSTALLED BY FIRESTONE
- SW-1 MONITORING WELL INSTALLED BY CECIL COUNTY
- B-6 MONITORING WELL INSTALLED BY THE STATE OF MARYLAND
- BEDROCK WELL (LOCATION APPROXIMATE)
- 3251 SAMPLE LOCATIONS
- 0.2 ISOPLETH (CONTOUR INTERVAL – 0.2 MICROGRAMS PER LITER)

SCALE
0 200 400 FEET

FIGURE 10

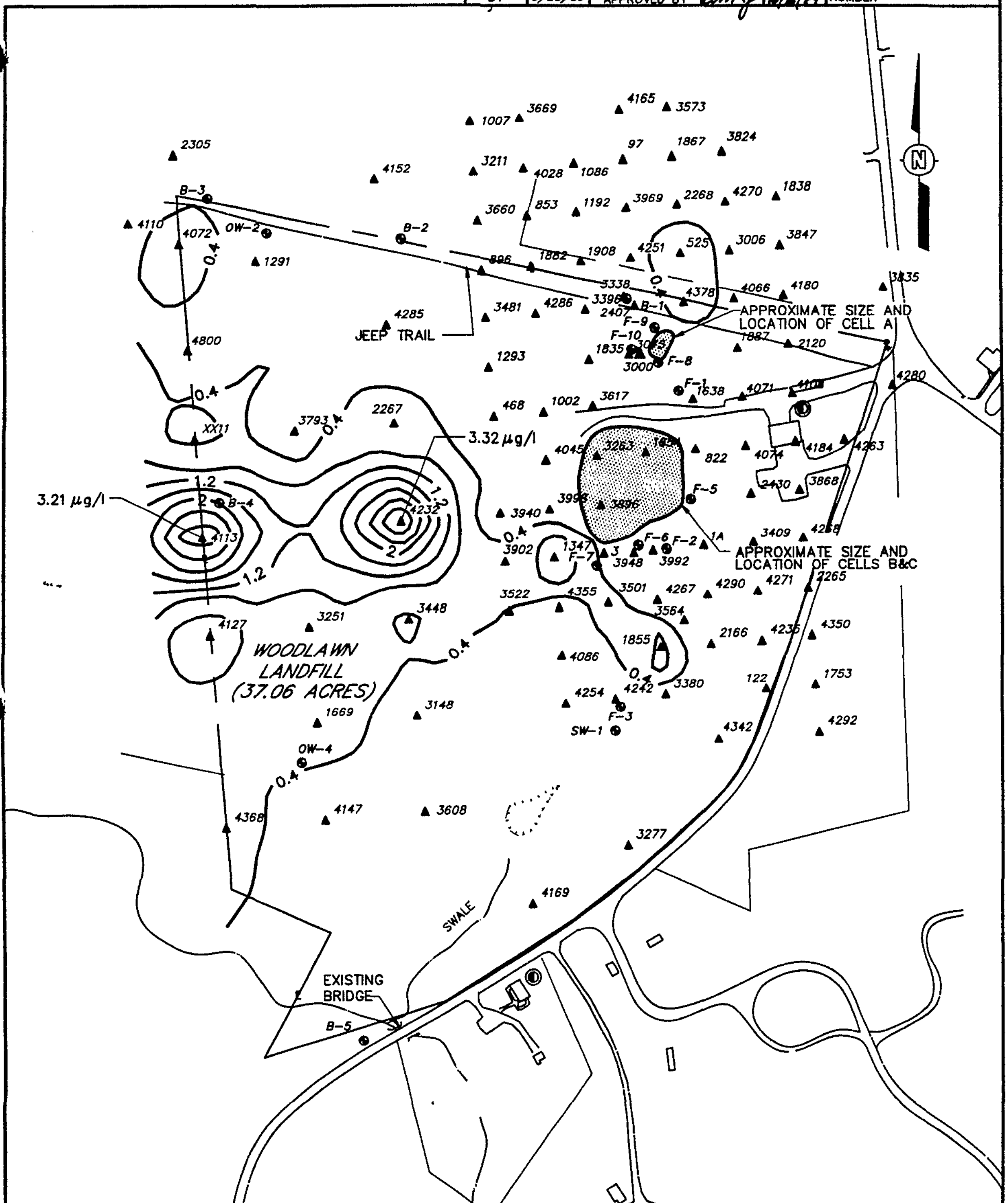
SOIL-GAS ISOPLETH MAP OF 1,1 – DICHLOROETHANE

PREPARED FOR

WOODLAWN LANDFILL RI/FS

INTERNATIONAL TECHNOLOGY CORPORATION

DRAWN BY	GSJ 9/28/89	CHECKED BY / APPROVED BY		DRAWING NUMBER 303486-B43



LEGEND

F-2 MONITORING WELL INSTALLED BY FIRESTONE

SW-1 MONITORING WELL INSTALLED BY CECIL COUNTY

B-6 MONITORING WELL INSTALLED BY THE STATE OF MARYLAND

BEDROCK WELL (LOCATION APPROXIMATE)

3251 SAMPLE LOCATIONS

ISOPLETH (CONTOUR INTERVAL – 0.4 MICROGRAMS PER LITER)

SCALE
0 200 400 FEET

FIGURE 11

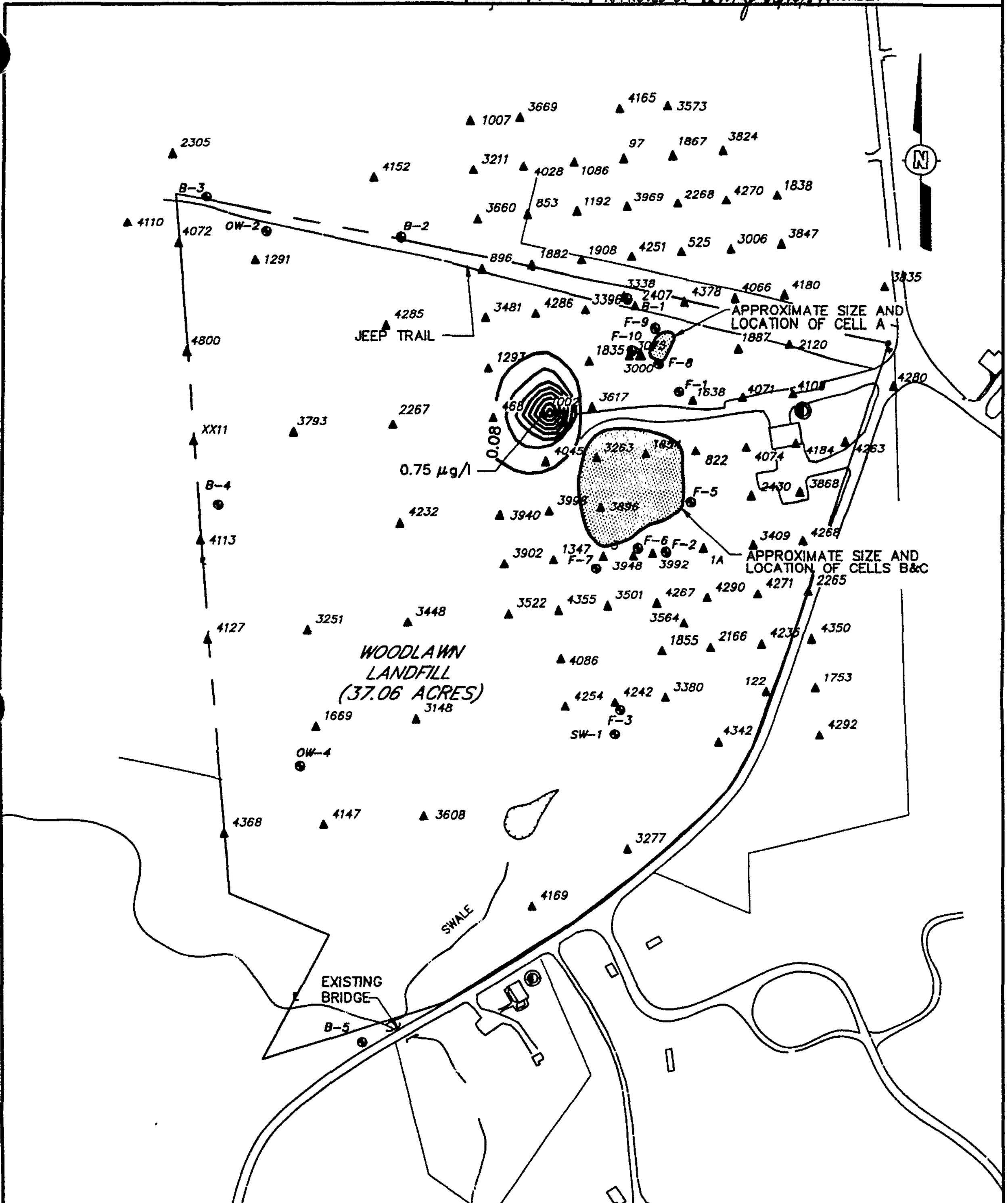
SOIL-GAS ISOPLETH MAP OF CHLOROBENZENE

PREPARED FOR

WOODLAWN LANDFILL RI/FS

IT INTERNATIONAL TECHNOLOGY CORPORATION

DRAWN BY	GSJ 9/28/89	CHECKED BY			DRAWING NUMBER 303486-B52
		APPROVED BY			



LEGEND

- F-2 MONITORING WELL INSTALLED BY FIRESTONE
- SW-1 MONITORING WELL INSTALLED BY CECIL COUNTY
- B-6 MONITORING WELL INSTALLED BY THE STATE OF MARYLAND
- BEDROCK WELL (LOCATION APPROXIMATE)
- 3251 SAMPLE LOCATIONS
- 0.08 ISOPLETH (CONTOUR INTERVAL – 0.08 MICROGRAMS PER LITER)

SCALE
0 200 400 FEET

FIGURE 12

SOIL-GAS ISOPLETH MAP OF DICHLOROMETHANE

PREPARED FOR

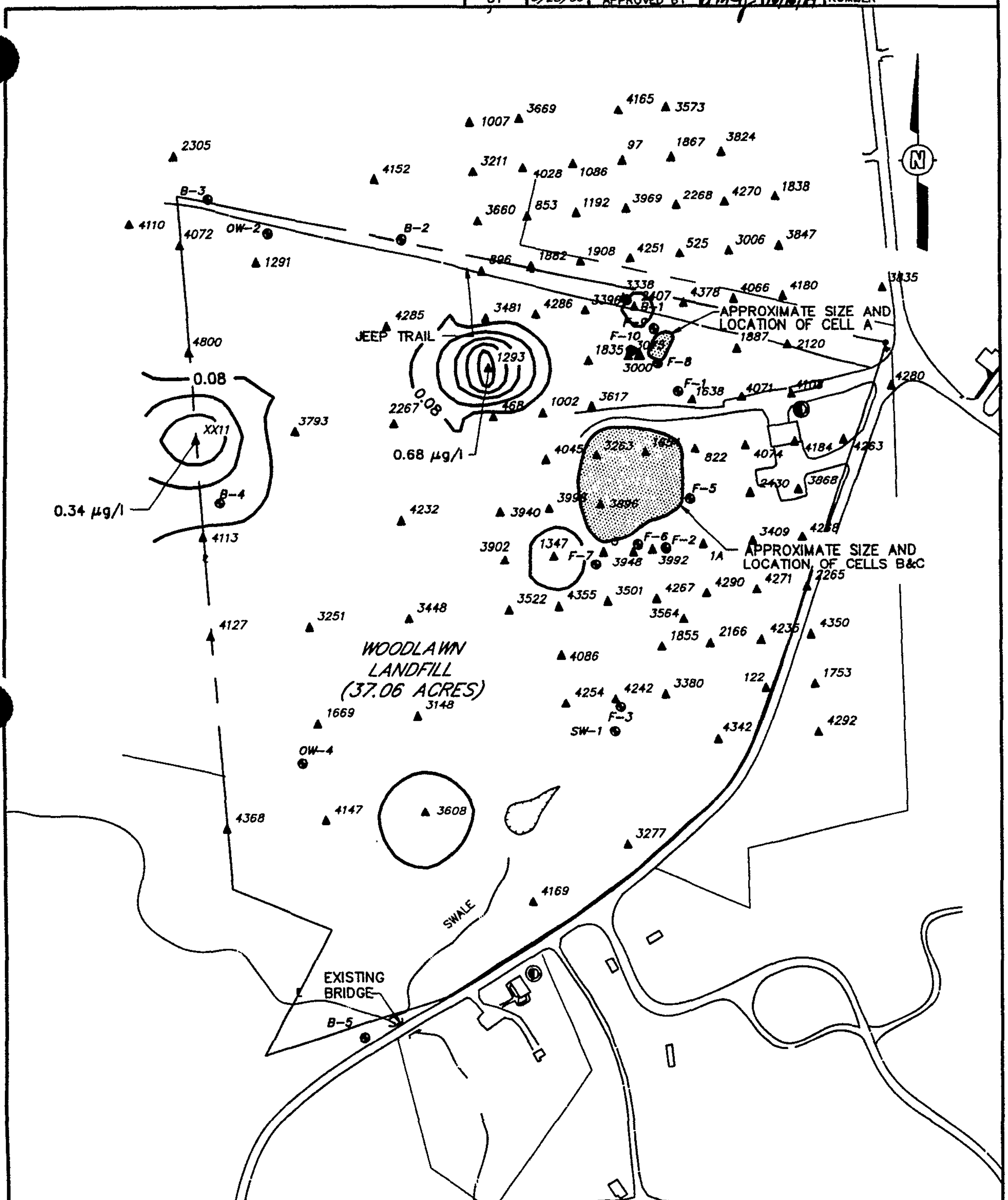
WOODLAWN LANDFILL RI/FS

INTERNATIONAL TECHNOLOGY CORPORATION

132298

AR300996

DRAWN BY	GSJ 9/28/89	CHECKED BY	[illegible] 10/10/89	DRAWING NUMBER	303486-B50
		APPROVED BY	[illegible] 10/10/89		



LEGEND

F-2 MONITORING WELL INSTALLED BY FIRESTONE

SW-1 MONITORING WELL INSTALLED BY CECIL COUNTY

B-4 MONITORING WELL INSTALLED BY THE STATE OF MARYLAND

BEDROCK WELL (LOCATION APPROXIMATE)

3251 SAMPLE LOCATIONS

0.08 ISOPLETH (CONTOUR INTERVAL – 0.08 MICROGRAMS PER LITER)

SCALE
0 200 400 FEET

FIGURE 13

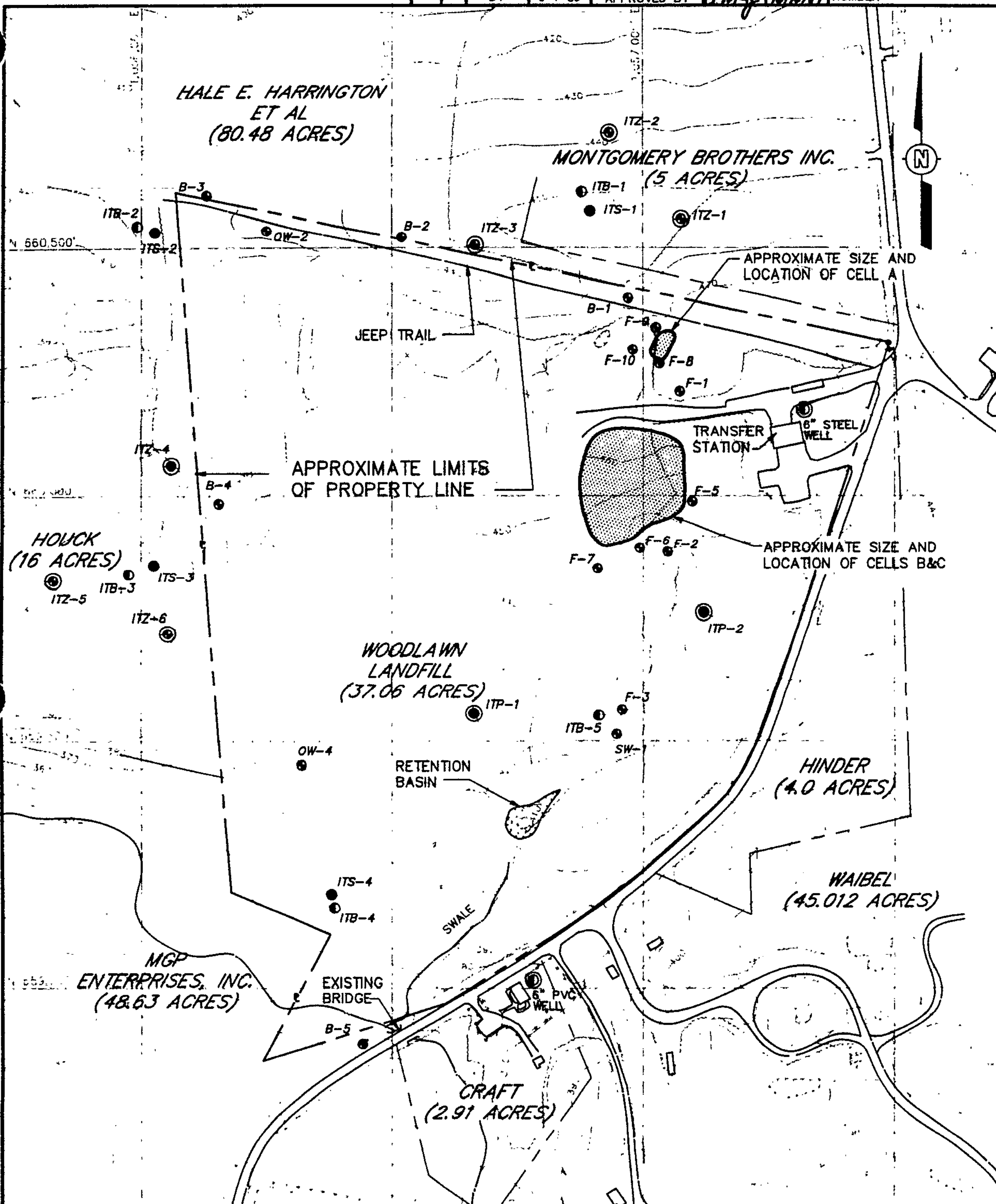
SOIL-GAS ISOPLETH MAP OF METHYL ETHYL KETONE

PREPARED FOR

WOODLAWN LANDFILL RI/FS

INTERNATIONAL TECHNOLOGY CORPORATION

50% 78 / 9.K 78	DRAWN BY	GSJ / 9-1-89	CHECKED BY / APPROVED BY	10/10/89 / 10/10/89	DRAWING NUMBER	303486-B54



LEGEND

- F-2 — MONITORING WELL INSTALLED BY FIRESTONE
- OW-4, SW-1 — MONITORING WELL INSTALLED BY CECIL COUNTY
- B-6 — MONITORING WELL INSTALLED BY THE STATE OF MARYLAND
- BEDROCK WELL (LOCATION APPROXIMATE)
- ITB-1 — PROPOSED BEDROCK WELL (LOCATION APPROXIMATE)
- ITS-1 — PROPOSED SOIL WELL (LOCATION APPROXIMATE)
- ITP-1 — PROPOSED PERCHED-WATER WELL (LOCATION APPROXIMATE)
- ITZ-1 — PIEZOMETER (LOCATION APPROXIMATE)

SCALE
0 200 400 FEET

FIGURE 14

PROPOSED MONITORING WELLS FOR PHASE II

PREPARED FOR

WOODLAWN LANDFILL RI/FS

INTERNATIONAL TECHNOLOGY CORPORATION

APPENDIX A

AR300999

APPENDIX A

U.S. EPA APPROVAL FOR SOIL-GAS PLAN MODIFICATIONS AND SUBMITTAL SCHEDULE

AUG 17 1989

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
841 Chestnut Building
Philadelphia, Pennsylvania 19107

August 11, 1989

Dr. Alan M. Jacobs
International Technology Corp.
2790 Mosside Boulevard
Monroeville, Pa. 15146-2792

Dear Dr. Jacobs,

In regard to our phone conversation of 8/10 and your fax to me on 8/11, EPA approves of the alterations as outlined below:

1. The soil gas survey is still viewed as an important part of the project and should be completed as soon as weather conditions permit.

2. Soil gas sampling will consist of the 30- to 36-inch penetration depth only.

3. Based on the data collected to this point, the number of sampling points will be reduced to 122 as outlined in the revised sampling plan map.

4. Decontamination of field sampling equipment may be performed using a propane torch.

5. The schedule of deliverables will remain unchanged except for, the reporting of the soil gas survey results which will be an addendum to the Phase I report, and the locations of wells in the Phase II Work Plan which will be preliminary. I would like to include in the Phase II Work Plan, as per our phone conversation, two stages of well installation. The first will proceed immediately upon approval and not be dependent on soil gas data, while the second will rely on the soil gas results for final positioning of the well sites.

6. The soil gas survey will proceed as soon as weather permits with the submission of an addendum to the Phase I report, and finalization of the well locations for the Phase II Work Plan to follow in a timely

AR301001

fashion. In regard to this, I would like to discuss with you your time requirements for laboratory analysis and report writing. Please phone me with this information when it is determined.

Sincerely,

Mark R. Noll, Ph.D.
Remedial Project Manager
De/Md Section

cc: George B. Markert, Firestone
Joseph B. Gormley Jr., Black & Veatch
Sarah Hokanson, Earth Technology
David Healy, MDE

A33-4_UGB489082 24time
C18C

AUG 28 1989

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
841 Chestnut Building
Philadelphia, Pennsylvania 19107

August 24, 1989

Mr. George B. Markert
The Firestone Tire & Rubber Co.
1200 Firestone Parkway
Akron, Ohio 44317

Dear Mr. Markert,

EPA approves of the changes made in the criteria for soil-gas mobilization as stated in your letter of August 21. Additionally, and after discussions with Dr. Alan Jacobs of IT Corp, I expect to receive the Phase I Addendum for the soil-gas study and final placement of all Phase II wells within 45 days of demobilization from field for the soil-gas survey. This time frame concurs with the time anticipated to complete this task in the original Phase I Work Plan, and takes into account the need for manual sample analysis.

Sincerely,

Mark R. Noll, Ph.D.
Remedial Project Manager
DE/MD Section

cc: Alan Jacobs, IT Copr.
Joseph Gormley, Black & Veatch
Sarah Hokanson, Earth Technology
David Healy, MDE

AR301003

AR301004